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ABSTRACT

This is the first of two volumes containing papers focusing on reading processes and pedagogy that were drawn from the nineteenth annual meeting of the National Reading Conference held in 1969. Among the topics discussed in the 42 papers are the following: underlining, individualized reading instruction, reading improvement programs in industry and education in the United States and Canada, semantic constructs and beginning reading, reading research, reading tests, reading comprehension, reading performance, language and critical reading, personality differences and learning styles in reading, word recognition, individual differences in reading, the decoding process in silent reading, the effect prior letter knowledge on the learning of sight words, lexical and structural items as predictors of readability for high and low ability readers, and psychological principles in a strategy for teaching the reading of a standard dialect. (FL)

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Reading: Process and Pedagogy

NINETEENTH YEARBOOK OF THE
NATIONAL READING CONFERENCE
IN TWO VOLUMES

VOLUME I: PROCESS

Edited by
George B. Schick
and
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Purdue University

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PREFACE

The Nineteenth Yearbook of the National Reading Conference contains selected papers presented at the Nineteenth Annual Meeting which took place at Georgia State University in Atlanta, Georgia, on December 4, 5, and 6, 1969.

The papers have been selected for publication by a special committee and generally put together in alphabetical order with but one exception: The President's Address is placed first.

The Journal of Reading Behavior

A Scholarly Quarterly in Reading

PURPOSE

The National Reading Conference has launched a new quarterly journal, **The Journal of Reading Behavior**, in January, 1969. This scholarly journal will publish mainly four types of articles: original research in reading and verbal behavior, discussions of theoretical positions, critiques of pedagogical approaches to reading instruction, and expository discussions of areas of concern in reading and related disciplines.

It is designed to provide a means of communication between those people interested in reading and those working in such related fields as psychology, counseling, remedial instruction, verbal behavior, and learning disabilities.

SCOPE

Generally, articles published in the journal will be on the secondary school, junior college, college, university, and adult education levels. However, any article dealing with significant aspects of reading behavior, regardless of the population employed, will be considered for publication. **The Journal of Reading Behavior** welcomes excellently conceived articles about significant issues in reading. In particular, it welcomes reports of research and theoretical articles which add valid information in such areas as the nature of the reading process, what the reading behaviors are, how to study reading behaviors, reading behavior as an aspect of verbal behavior, how one learns to process information, and improving reading behaviors.

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The chief features of the journal will be an editorial page, scholarly articles, book reviews, and a readers' dialogue (commentaries from the readers on articles published in the journal and on issues in reading).

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The Journal of Reading Behavior will be published four times a year, Winter, Spring, Summer and Autumn. Individual subscriptions are $8.00 per volume per year. A special annual rate is available to libraries at $15.00 per volume year for one regular and one bindery copy of each issue.

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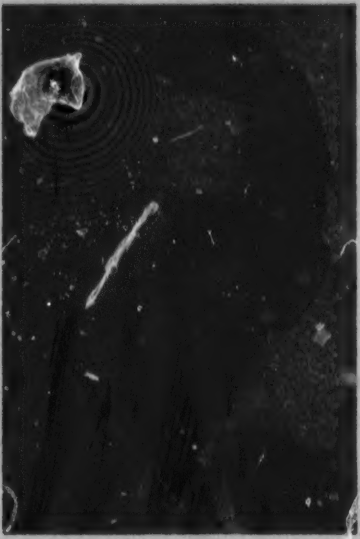

Oscar S. Causey

The Oscar S. Causey Award for Outstanding Achievement in College-Adult Reading

Remarks of Hazel Horn Carroll in presenting the 1969 Oscar S. Causey Award to George G. Spache on behalf of National Reading Conference.

The person to receive the 1969 Oscar S. Causey Award has such a long and impressive list of achievements that it would take a speeded-speaker to relate them in the time alloted. It will be necessary to choose from his long list of activities and summarize since this group does not advocate excessive speed in reading or speaking.

In the short span of ten years he received his high school training at Maxwell Training School in New York and his B.S., M.A., and Ph.D. degrees at New York University.

His varied teaching and professional experiences include twenty-six years of college teaching at New York University, Rutgers, and for most of these years at the University of Florida as Head of the Reading Laboratory and Professor of Education. In addition, he has been an elementary school teacher, a school psychologist, a member of a county board of educational services, and a consulting psychologist for industry all in the New York City area.

The recipient is steeped in reading information of all kinds and writes in the field prolifically. He has authored over a hundred articles, standardized tests, and numerous books including such well-used volumes as *The Art of Efficient Reading* (with Paul C. Berg), *Toward Better Reading, Good Reading for Poor Readers* which will have a revised edition soon, a second edition of *Reading in the Elementary School* with Evelyn Spache, and a new book, *Reading for the Disadvantaged,* due in early 1970. In fact, our honored member has so many books to his credit and they are so well received that most any year teachers can be overheard saying, "Have you seen George Spache's new book?"

He has spoken frequently and fluently to more than forty reading conferences in thirty-five states, including Hawaii, and in Canada and France, to optometric conventions in twelve states, and as a consultant for many schools, foundations, and business institutions.

These numerous and distinguished activities have won for him many honors and citations including listings in *Who's Who in the Southeast, Who's Who in the South and Southwest, Who's Who in American Education,* and *American Men of Science.*

Professional organizations have claimed much of his time and talent, and he has served as president for the National Association for Remedial Teaching, Reading Research Services, International Reading Association, and for our own National Reading Conference.

It is this group which honors him tonight—National Reading Conference awards the 1969 Oscar S. Causey Award to one of its most distinguished members, George G. Spache.

The Problem of Definition in a Non-Existing Profession: Presidential Address

Alton Raygor
University of Minnesota

The idea of a Presidential Address is new to this organization. It calls for president-like behavior. But I don't know what that is. The National Reading Conference is a strange group and to be president of it is an even stranger thing.

Several things have happened in the past few years that have made me feel the need for an appraisal of the college adult reading field and its professional and scientific position.

A few years ago, at a conference of editorial advisory boards of all the International Reading Association journals and the Publications Committee of the International Reading Association it became clear that the primary audience of the *Reading Teacher* was to be the elementary classroom teacher of reading. The *Reading Research Quarterly* was to serve the scientific community in reading at all levels. The *Journal of Reading* was to serve the high school and college level. However, since the two new editors were primarily secondary reading specialists, and since a later survey was to show that only 5 per cent of the International Reading Association members were employed in colleges anyway, it was clear that the primary function of none of the International Reading Association journals could appropriately serve only the college level. So the college-adult reading field was left without a journal. Some of us were aware that a new journal became inevitable at that meeting. It did not appear until this year, but it was clear to some of us that the National Reading Conference would have to produce a journal if the college-adult level was to be served. The result is the *Journal of Reading Behavior*. In the process of losing and gaining a publication with which we could identify, we went through a kind of identity crisis as a professional group.

Another event that has called for some self-examination was the appearance of the commercial super-speed reading fad, complete with its devotees in high places and its supporters within the academic community. The lack of effective action on the part of any professional group with regard to the super-speed reading problem makes it clear that one of the primary functions of a professional group—the professional ethics or policing function–simply was not being performed. We had neither the bureaucratic superstructure nor the confidence of the public. Both are necessary for effective action.

The super-speed reading problem also brought out another problem. It became clear that we had no satisfactory way of answering questions which involve the specification of our field of scientific inquiry or the limits of our professional services. We were tempted to say, "that isn't reading as we define it," but of course we hadn't defined it, so our ad hoc efforts were not much help. Scientists and practitioners in the medical field can deal successfully with witch doctors partly because they have pretty clear legal and scientific specifications that *define* the field of medicine. We have almost nothing of the sort.

Other events that have made me aware of a need to examine our professional and scientific posture have to do with efforts on the part of the International Reading Association to fulfill their professional responsibilities. We have been invited to join the International Reading Association in several efforts. Some joint meetings have been attempted, and we have had some relationship problems. Recently the International Reading Association has been attempting to pursue problems relating to college-level teacher certification, and the National Reading Conference was invited to join in that enterprise. We took the position that we did not want to be involved in the political aspects of the field—that we are a scientific group, not a political action group. The International Reading Association is going ahead without us. Recently we were asked by the International Reading Association to join in the development of a statement to the public on the responsibilities of the Reading Teacher. We will be meeting with them and will decide later whether to co-sponsor the public statement. I bring this up because it is an example of the kind of pressures and needs that any professional group will encounter. Some form of self-image is needed to provide a basis for action. If we are a professional group, we do one thing. If we are a dis-engaged scientific society, we do another. In the case of the National Reading Conference, not only have we not decided; we haven't even looked into the problem.

Another set of events that demonstrates a need for a clearer self-image has to do with the program for the past two conferences. Last year I tried to encourage the submission of papers on college-adult reading and did not encourage papers on elementary reading. I found, to my surprise, that we had members of the Board of Directors who did not think of us as a college-adult group, and that they felt we couldn't successfully distinguish college-adult reading from any other kind of reading. One more time we were limited by our lack of agreement on our goals and our identity.

We return now to the title of these remarks. I have been giving examples of two basic needs that seem to me to be crying out for attention on the part of those who spend their lives associated with the college-adult reading field and the National Reading Conference. One is the need to get a clearer picture of the college-adult reading field as a profession. The other is the need for a clearer understanding of the nature and limits of the scientific sub-specialty that constitutes our field of knowledge.

What is a professional reading specialist? Does the term have any meaning? Are we in a profession, an art, or a science? Is the National Reading Conference a social club, a mutual applause society, a professional organization, an academic and scientific association, or an annual reunion?

One way to find an answer to this question is to examine the characteristics of a profession to see if we fit. Fortunately we don't have to do this whole thing for ourselves. There are people who try to make a profession of studying professions. A great body of literature exists on the topic of the characteristics of professions and a lot of interesting generalizations about how they develop. The whole area of the sociology of work is extremely popular these days and even boasts its own sub-specialists, dealing with such topics as the professionalization of labor groups and the dynamics of the ministry as a profession. While there is a great deal of disagreement about the details and about the relative importance of each, certain characteristics are generally agreed upon as the basis of a profession. The following quotation is typical, and will provide us with a point of departure for our discussion. It is from *Professional People,* by Roy Lewis and Angus Maude, Phoenix House, Ltd. London, 1952, pp. 55-56:

> We may place first a *body of knowledge* (science) or of *art* (skill) held as a common possession and to be extended by united effort. Next is an Educational Process based on this body of knowledge and art, in ordering which the professional group has a recognized responsibility. The third is a *Standard of Professional Qualifications* for admission to the professional group, based on character, training and proved competence. Next follows a *Standard of Conduct* based on courtesy, honor and ethics, which guides the practitioner in his relations with clients, colleagues and the public. Fifth, we may place more or less formal *Recognition of Status* by one's colleagues or by the State as a basis of good standing. Finally there is usually the *Organization of the Professional Group,* devoted to its common advancement and its social duty rather than the maintenance of an economic monopoly. Professional status is therefore an implied contract: to serve society over and beyond all specific duty to client or employer in consideration of the privileges and protection society extends to the profession.

Let's look at these attributes of the professional and see how the college-adult reading person fits. First the body of knowledge—Some very important points about the relationship between a body of knowledge and a profession were made recently by Goode. (Goode, William J., "The Theoretical Limits of Professionalization" in *The Semi-Professions and Their Organization,* Etzioni, Amitai, ed., The Free Press, N.Y., 1969, pp. 277-278.):

> With respects to knowledge, seven major characteristics affect the acceptance of an occupation as a profession.
>
> 1. Ideally, the knowledge and skills should be abstract and organized into a codified body of principles.
> 2. The knowledge should be applicable, or thought to be applicable, to the concrete problems of living. (Note that metaphysical knowledge, however well organized, may have no such applicability.)
> 3. The society or its relevant members should believe that the knowledge can actually solve these problems (it is not necessary that the knowledge actually solve them, only that people believe in its capacity to solve them).
> 4. Members of the society should also accept as proper that these problems be given over to some occupational group for solution (thus, for example, many do not as yet accept the propriety of handing over problems of neurosis to the psychiatrist) because the occupational group possesses that knowledge and others do not.
> 5. The profession itself should help to create, organize, and transmit the knowledge.
> 6. The profession should be accepted as the final arbiter in any disputes over the validity of any technical solution lying within its area of supposed competence.
> 7. The amount of knowledge and skills and the difficulty of acquiring them should be great enough that the members of the society view the profession as possessing a kind of mystery that it is not given to the ordinary man to acquire, by his own efforts or even with help.

Note that when we look at our field from the point of view of its body of knowledge, relatively few of these conditions are met. Our society is not ready to assume we have exclusive claim to a body of knowledge created, organized and transmitted by us in an arbitrary, codified way so that we can have this kind of charisma.

When we look at the next attribute, an *educational process,* we are in better shape. Although we do have higher education organized so that the technical skills and knowledge are available, it is by no means clear that a common core of training exists.

The same may be said of the notion of a *standard of professional qualifications.* To some extent the possession of an appropriate Ph.D. might be taken to demonstrate training and proven competence, but most of us would not agree. As I indicated earlier, this matter of professional qualifications in an area into which the International Reading Association is now moving, with or without our advice or consent.

On the matter of a *Standard of Conduct* which guides the professional, we do have some rather vague ethics standards. (Here again the International Reading Association is ahead of us, but not far). On the other hand ethical standards are of little or no help without the appropriate sanctions to be applied, when they are violated. Our professional ethics have not been of much help, for example, in dealing with the problem of inappropriate services offered to the public by those in the business world. We simply do not have any power that the average citizen doesn't have.

On the matter of *recognition of status* by colleagues or the state, we have some informal kinds of status that have to do with degrees and university employment. Some also have various forms of state certification. Curiously, certification is a much sought-after status indicator in most other professions, but in our field it means very little except to indicate part of the history of the professional person. The fact that one of our members has a teaching certificate does not in itself confer any special high status on him.

Finally we come to the last attribute listed by Goode—the *organization of the professional group.* When we compare the purpose and function of the American Medical Association, or the American Institute of Architects, or the American Bar Association with this group we see immediately that while we do have an organization, it does not play the central role in our professional or economic lives that some others do.

I have mentioned only a small number of the identifying traits of professions. Some other we could deal with that have been mentioned by sociologists are high income, prestige and influence, high educational requirement, professional autonomy, licensure, formal codes of ethics, and monopoly over a task. Rather than discuss them, let me turn for a moment to the natural history of professions. They go through some identifiable stages following a common pattern, with some minor variations. Wilensky (Wilensky, Harold, "The Professionalization of Everyone?", *American Journal of Sociology,* 70, (Sept. 1964, 142-146) suggests the following steps:

1. Full-time activity at the task.
2. Establishment of university training.
3. National professional organization.
4. Redefinition of the core task to give the "dirty work" to subordinates such as nurses, technicians, research assistants, or teacher aides.
5. Conflict between the old timers and the new men who seek to upgrade the job. Sometimes this results in the creation of new job titles to differentiate the new from the old. In this process janitors become custodians, garbage collectors become sanitary engineers, and

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junk dealers become salvage consultants. I don't know what college reading specialists become.

6. Competition between the new occupation and neighboring ones. The clearest and nearest example of this is the situation existing between clinical psychology and medicine. I see little of this kind of conflict in our case.

7. Political agitation for legal protection in the form of certification, licensing, or registration. We are seeing this now as the International Reading Association pushes for certification of college teachers of reading.

8. Codes of ethics. Here again we are not at this stage yet, but the International Reading Association is working on it.

It seems very clear that the National Reading Conference has not been moving in any organized campaign for professionalization. In fact we have made a few moves which retard such development, but we hear demands for the advantages that might be gained by such a move. Only a real profession can have the controls we sometimes want. As Wilensky puts it (p. 139), "Any occupation wishing to exercise professional authority must find a technical basis for it, assert an exclusive jurisdiction, link both skill and jurisdiction to standards of training, and convince the public that its services are uniquely trustworthy." If we want to control the charlatans and the quacks, we need this kind of political power. The only way to get it is through professionalization. That means highly developed and influential professional societies, legalistic controls on practitioners through certification or licensure, formal controls on professional actions by powerful ethics monitors, and other things we have actively avoided. Most of us do not want to be licensed, registered, or ordained into a professional status.

On the other hand we can avoid all this by identifying ourselves only with the scientific aspects of our work. The National Reading Conference has always had more of the flavor of a scientific society than it has a professional group. However, if we do decide to be a scientific society we have to be ready to give up the hope of performing certain functions for each other. The scientist as a scientist does not deal with professional matters. He may care who offers services to a professional, but as a scientist, he is officially disinterested.

Wilensky (p. 141) makes an interesting distinction in talking about estimating how many occupations or scientific specialties are professionalized:

> An obvious difficulty here is the overlap between a scientific discipline (psychology, physics) and a profession (the practice of clinical psychology, aerospace science). A science, in contrast to a profession, has no clients except, in an ultimate sense, society and bosses, if any are often indeterminate. The main public for the scientist is fellow-scientists, who are in a position

to judge competence. The main public for the professional is clients or employer-clients, who usually cannot judge competence.

I have been leading us to the second major topic I want to discuss —the problem of definition in the scientific area we try to understand. If we are to be scientists rather than professional practitioners, we should be able to specify what it is we are scientists *about*. Or to put it another way, if reading is our scientific specialty, what, exactly, do we mean by reading? If we ask a paleo-botanist to tell us exactly what it is he studies and how he defines his field he is likely to say, for example, that he studies the flora of the pre-Cambrian era. (I know one such paleo-botanist, and he will also tell you that he restricts his inquiry to pre-Cambrian flora north of the Artic Circle!) We need a similar set of delimiting and defining concepts in our field, if we are to claim to be a scientific specialty.

Helen Robinson has already addressed herself to this problem and finds in the published research great confusion of three things— 1. the process of reading, 2. the teaching of reading, and 3. the outcomes or results of reading. (Robinson, Helen M., "The Major Aspects of Reading," Chapter III in *Reading: Seventy-Five Years of Progress*, ed., H. Alan Robinson, Chicago, University of Chicago Press, 1936, pp. 22-23.) A child reads a recipe and bakes a cake. We can easily distinguish the process of teaching him to read from this independent reading behavior. We can also distinguish the baking of the cake from the reading behavior.

While it is true that we are interested in the pedagogy of reading, we cannot be sure that it is being taught until we have found out what it is. To put it another way—we have to know how to recoginze and identify reading behavior before we can productively study methods of producing reading behavior.

Likewise, we are interested in what people do with their reading, and in the general outcomes of reading behavior in our society. However, the outcomes of reading must be distinguished from the reading behavior itself or we have a hopeless confusion, in which any possible behavior which might be the result of reading becomes the focus of our primary scientific study. Clearly the science of reading must deal first with an identifiable behavior or set of behaviors to be called reading. We do this by deciding what behaviors we include and exclude when we use the term "reading."

This approach to a definition does not solve any of the scientific questions in the field of reading. It allows us only to tell when we are talking about reading behavior and when we are not. That may not seem to be a very big thing at first glance, but as we look at the things written in and out of textbooks and journals we are struck by the lack of scientific precision and the lack of real additions to knowledge.

Using some clearly delimited statement as to the identity of reading behavior we can at least tell when we are finding out more about it. We can look at proposed reported research and make some judgment as to whether it can or has added anything to an understanding of the reading process. If it has, then it is a scientific study in reading. If not, we can ignore it as scientist. Given the nature of most of the research we have now, based on unidentified notions of what reading behavior is, it is difficult to summarize or integrate what we know. A clear definition would allow us to see the gaps in our knowledge and might even keep us on the topic as we try to fill them in.

To go back new, to the general topic—The Problem of Definition in a Non-Existing Profession—maybe we can see a little more clearly what our alternatives are and where we might go from here.

We can continue to fail to define the nature of our commitment. This will result in a continuation of the present confusion and seems like a bad alternative.

We can decide that we want the field of college-adult reading to become a profession, and the National Reading Conference a professional group. If this is our decision, there are some very clear paths to follow to meet that objective. It involves an effort to firm up and formalize a required educational process to be followed in entering the profession and probably some standard curriculum approved by the professional group. It also involves the creation of some powerful body of watchdogs in or out of government to assess both training and professional behavior. This group would control entrance into the profession in the manner of a medical association, a state bar examination board, or an ordinating committee.

Such a group would also control the behavior of members by enforcing standards of conduct with regard to professional courtesy, honor, and ethics, guiding the practitioner in his relations with clients, colleagues, employers, and the public. Such a group would have to be satisfied by a member who wanted to continue to be part of the professional group.

On the other hand the National Reading Conference could decide to be a scientific society, devoted to the advancement of science in the highly specialized field of the study of reading behavior. This alternative would require that we become much more vigorous in our selection of topics and papers, and that we carefully define the area of science we want to claim as our special province. We would then refuse to concern ourselves with ethical problems, training standards, and other social rather than scientific issues.

It would be presumptuous for any one person to try to make this kind of commitment for a group, even if he could. I have no interest in doing so. I simply want to point out that many of the frustrations we feel as members of this group result from the fact that we have become neither a profession with a clear social mission nor a scientific society with a clear definition of its area of scientific investigation.

Whatever direction the National Reading Conference and the college-adult reading field take, I do have a strong commitment to one thing, and that is the emotional tone of this organization. In my experience it is unique. The informality, the identification of all of us as friends together like an annual reunion, the lack of unnecessary bureaucracy, the openness of communication, are the values that out-weigh any other considerations I have mentioned. We must keep them at all cost.

Underlining: The Graphical Aid to College Reading

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INTRODUCTION

Unfortunately, the term underlining has been ignored by the writers of the *Dictionary of Education*. Webster (20), however, has defined underlining as "a horizontal line placed under something," while study skills specialists have rather loosely referred to the term as "underscoring, marking, circling, starring, accenting, bracketing, parenthesizing, dotting, jotting, lettering, numbering; the making of dashes, arrows, short, vertical lines, diagonal strokes; and writing marginal notes." Throughout this paper, the broad concept of underlining is used to represent any and all of these terms. Likewise, the phrase, textbook markings, is synonomously employed.

Although habitually practiced by nearly 100 per cent of today's college students who own their textbooks, research on the subject of underlining has been indeed scanty. This paucity of research may be due, in part, to the fact that while writers have frequently alluded to the technique in their general discussions on study skills, they have been remiss in according the phenomenon of underlining a place of significances in the hierarchy of skills per se, or as a graphical aid to comprehension.

If underlining should not be termed such an aid, then, neither should such other graphical aids as italics, the comma, the period, and similar signals in written communication. Just as the author uses these signals to aid the reader in his interpretation of what he reads, so the reader himself has the obligation to use whatever self-help he can muster to aid him in understanding and remembering what he reads. It does not, therefore, seem unreasonable to assume that individuals who employ the use of underlining do so for a purpose,—hopefully that of becoming more comprehensive readers. (It is understood that underlining as mere doodling has no effect on the reader, and therefore, is not a concern of this paper.)

To be sure, reading college textbooks is an exacting and demanding process, and it behooves each student to become cognizant of the various means of achieving effective comprehension and recall of materials read. Just as scanning a passage highlights the difficult and easy sections in order that the reading of it may be paced, so does underlining highlight the major points and details to be given attention during review.

Many college students have engaged in the practice of underlining with profit to themselves perhaps without really knowing that it is a unique aid, commonly practiced by many others desiring to get more out of their reading. Consequently, at least superficially, underlining appeared to be a muted, prized possession of one alone.

On the contrary, there is much evidence that hosts of students dare not write in their textbooks lest the re-sale value is lost. A mere glance at the number of USED textbooks in college bookstores at the beginning of each semester attests to this fact. In addition, there are numerous cases of students who have a so-called "hang-up" about textbook marking from earlier days when both parents and teachers admonished them NOT to write in their books. Others prefer to take notes, and to outline rather than subject their textbooks to the "sloppiness of markings." Little is actually known of the superiority of one form of studying over another, but recent research in the area is pointing to some astonishing results.

REVIEW OF LITERATURE

The extremely high volume of production in the general area of study habits and skills attests to the pronounced interest of educators in the academic success of students at all levels. However, as previously pointed out, underlining has not until recently been given a position of major importance in the hierarchy of study skills. Statements and studies mentioned here present a trend toward more practice of the skill.

One of the first to recognize the importance of underlining as a study technique was Fred McMurry (11, 107) who, as early as 1909, gave special emphasis to the topic in his volume on *How to Study*. He admonished the reader that: "Thoughtful marking, with the view of showing relative value, is likely to increase the amount of reflection on the part of the one who makes the marks. . . . It is likely, also, to increase the amount of reflection on the part of the later reader, for he, seeing the marks, is inclined to weigh the thought long enough to decide whether he agrees or disagrees with the previous reader." McMurry (11) further saw short vertical lines in the margin as indicative of different degrees of worth in some system of textbook markings.

Underlining received little or no attention in the literature for several years. Two decades later, however, recrudescence of the phenomenon was seen in the projections by Crawford (3) who emphasized that textbooks were more valuable AFTER they have been marked by the student than before. Crawford further saw marginal notations as more important than several sentences written in a separate notebook, and pointed out the false economy of reselling textbooks: "A college student who takes courses that are worthwhile spends so much money on them that he cannot afford to be stingy about buying and owning his textbooks, and about keeping them after the course is over. . . . If they are permanent, there is no reason why they should not be marked, underlined, and annotated for future use." (3, 312).

Robinson (14) considered underlining an important aspect of the SQ3R method of study. He cautioned, however, that students often underlined perfunctorily to the extent of conflict and confusion. He outlined the following directions which would lead them to avoid the delimma: "(1) wait until the end of a headed section before marking, (2) think about what the important point is, (3) underline only the key phrase or phrases, and (4) use a numbering or marking system that shows relationships among the points marked." Bennett (2) contended that the major purpose of underlining and making marginal notes was to aid in thinking and reviewing. Further, it "focuses on getting attention and meaning, on strengthening the memory, permits easy location of materials read earlier, and serves as a tremendous aid to continuous growth." Bennett did not, however, accord the technique a place in the system of organized notemaking.

Students were advised by Wren and Larsen (22) to "underline, preferably using a red pencil, all main points." They hastened to project, though, the following seemingly paradoxical statement: "Research reveals that outlining is superior to underlining . . . Marginal notations, which take much less time to make than underlining, can both help you in organizing the material . . . and also aid you in outlining it afterward." As if sensing their blow at underlining, Wren and Larsen (22, 25) returned to plug the technique in the suggestion: "Read the directions twice, and underline all significant words in the directions." . . . "Underline such words as: only, always, not, usually, in test questions before you answer them. . . ."

The superiority of outlining to underlining as a study technique was also proclaimed by Morgan and Deese (12), who, nevertheless concurred in the opinion of Robinson that too many students use a hit-or-miss system of underlining. These authors recommended the following course of action: (1) Insist on getting textbooks that have not been underlined. (2) Survey the material in a chapter, asking and attempting to answer questions about it. (3) Place light check mark or bracket in the margin near the seemingly important lines. (4) On a subsequent reading, determine if these check marks coincide with the main idea and supporting details. If so, (5) underline lightly the individual words and phrases essential to understanding the paragraph.

Farguhar, Krumboltz, and Wrenn (8) concurred with Robinson (14) in voicing a word of caution against underlining as one reads, rather than following an initial reading, and further suggested that the student tell himself the answer to his question and then return to the written material to underline key phrases and words.

Like Crawford (3), Resnick and Heller (13) emphasized that the main purpose of a book is to serve the student and not as a trade-in. The latter explained that some students prefer to use "colored pencils for underlining and annotating their textbooks . . . Major points are marked in red, minor ones in blue, examples in green, and so on." These authors further saw the drawing of diagonal lines and writing in the margins a word or two characterizing the function and brief summary of the paragraph as useful. This position was augmented by Staton as follows:

> When you start to study an assignment, pick up a pencil. Read a paragraph. Then pause to think about its content. . . . Write a few words in the margin of your text. . . . It is important that you actually write your summary of the paragraph in the margin of your book. . . . Study in this way, virtually guarantees high concentration and vast improvement in your comprehension. (16, 17-18).

Apparently, the *one* research study involving underlining using adequate controls was that conducted by Willmore (21), whose findings indicated that of four study techniques, underlining resulted in better short-term and long-term comprehension than did the SQ3R, Reading, or Outlining Method. Underlining was further found to be less time consuming than SQ3R or Outlining. These findings, of course, discredited the claims by Morgan and Deese (12) quoted earlier.

More recently, an experiment on study strategies conducted by Crewe (4) at the University of Minnesota also resulted in a word of praise for underlining as a study technique used in review and cramming sessions for examinations. Crew found that students who crammed and reviewed materials that they had underlined properly attained higher scores on two examinations over the materials studied than did students who made fewer or no underlines.

Wark and Mogen (18), authors of a programmed manual on underlining, predicted that since no two paragraphs are ever alike, there can be no method of underlining "guaranteed to work mechanically for every text." Thus, the student is admonished by these authors "to learn methods for appropriately evaluating his own underlining in any case." He is directed to 1) underline the right amount, 2) underline completely, 3) underline consistently, and (understand what the author said in order to) 4) underline correctly.

In this connection, Adams (1, 28) re-emphasized the fact that reading clinicians and tutors "should possess skill in acquiring and using many methods and techniques." She, moreover, projected that accomplishment in the acquisition and use of underlining as a study technique can best be measured through action research in each local setting by employing both traditional and innovative (19) methodologies of research.

Underlining, circling, marking x's, numbering, making marginal notes, and drawing lines from one picture or statement to another are common experiences for individuals learning to read. Consider

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the following examples of purposes and directives from a variety of well-known study skills manuals and reading worktext series:

Purposes	Directives
1. Use context and picture clues; clarify concepts	Underline in color, words you recognize in the exercise.
2. Use picture clues; practice in reading questions	Underline in the text words in the marginal list at bottom of page.
3. Use context; give practice in phrase reading	Underline the correct phrase that best completes the last sentence.
4. Follow story sequence; develop paragraph comprehension; use picture clues	Write the number of the correct picture in the box. Underline the same words in the story.
5. Develop visual recognition of initial consonant; promote good speech habits	Circle the picture that correctly completes the second sentence.
6. Strengthen sentence comprehension	Underline the word on the Dictionary Card each time it appears in the sentence.
7. Reading for details; develop paragraph comprehension	Circle the picture that best completes the last sentence.
8. Enrich word meaning; use of context clues	Find the sentence that best illustrates the use of each underlined word and draw a line between the sentence and that picture. Circle the new word.
9. Making inferences	Underline the best answer to each question in the exercise.
10. Recognize mood; follow printed directions; improve story comprehension	Box, circle, or underline each key as directed in the exercise below.
11. Review	Underline the meaning of the new word used in each sentence.
12. Find main ideas; supporting details	Underline twice each key idea. Underline once ideas supporting the key idea in each paragraph.
13. Questioning author's statements	Write a question mark or short question in the margin to denote your disagreement or misunderstanding of statement made.
14. Summarizing	Use a big S in the margins at sides and summarize briefly each paragraph. Write brief chapter summary in bottom margin.

Activities such as these begin in kindergarten and continue as one progresses through the grades, into college and adult reading programs. Since immediate reinforcement usually follows the execution of the activities, indelible impressions of the importance of underlining no doubt are made. Thus, it is little wonder that many college students and adults find underlining a useful aid to learning, and accordingly, approach their textbooks with some kind of graphic instrument in hand.

PURPOSE, HYPOTHESES, AND PROCEDURES

It was the purpose of this study to determine in a unobtrusive manner the extent of underlining employed by college students while studying their assigned textbooks during the 1969 Summer Session at Northern Illinois University in the following two courses: 1) Education 361, The Teaching of Elementary School Reading 2) Education 342, Teaching Social Studies and Science in the Elementary School.

A second purpose of the study was to assess the relationship between the amount of underlining and the Grade Point Averages for each of the two groups of students.

It was assumed that students who underlined most as they studied their assigned textbooks for the aforementioned courses, consistently underlined across courses, and, therefore, made higher grades than those who underlined least while studying. A Pearsonian Coefficient of Correlation was thus obtained between the students' Post Underlining Measures and their cumulative Grade Point Averages. Further, since two textbooks were assigned in Education 342, the relative position or rank of individual underlining in Social Studies and Science textbooks was examined by means of the Spearman Rank Difference Correlation. (5)

The following hypotheses were tested:

1. There is no statistically significant difference between the amount of underlining done by students in their reading textbooks during the first four weeks of the course and the amount of underlining done during the last four weeks of the course.

2. There is no statistically significant difference between the amount of underlining done by students in their social studies and science textbooks during the first four weeks of the course and the amount of underlining done during the last four weeks of the course.

A *t*-Test for Correlated Samples by Gourevitch (9, 233, 235) was used in the analysis of the data.

Listed as Number 2 among the requirements for both courses was: "Possession of Assigned Textbook (s)." As usual, a few students decided to subtly challenge this requirement, more especially since the bookstore did not carry a sufficient number or supply at the beginning of the Summer Term. Consequently, of the 33 students enrolled in Education 361, two used library books, and one made no marks in her book. Thus 30 reading textbooks (15) were used in the study. Similarly, two students in Education 342 shared social studies (10) and science (17) textbooks and one made no marks in her book, thereby reducing the number in each of these areas from 31 to 28 textbooks.

There was only one used book in Education 361 compared to nine used social studies books and eleven science books in Education 342. A random sample of twenty pages was selected in each assigned textbook for the study. Students were asked to leave their books with the instructor during the first, fourth, and eighth weeks of the term. On the first inspection, the total amount of underlining on the twenty pages was recorded. The amount underlined in each used book was subtracted from the amount recorded on the second and third inspections; the second inspection including only the first ten pages, and the third including only the last ten pages.

For convenience in counting procedures, each star, box, letter, number (excluding No. 1), parenthesis, etc. was accorded a measurement of one inch. As the books were being collected a second time, the instructor was queried as to the reason. "I have misplaced my record of the number possessing textbooks and the number of used books in the class," was the reply. No reference was made to the matter of underlining.

In addition to the outside readings assigned, open book tests were scheduled and assignments made which would entail the reading of most of the material included in the random sample of pages for a given period. On the next to the last day of class, a questionnaire entitled, "On Studying a College Textbook," was administered. The answers were tabulated, and reported to the students on the following day,—along with a presentation of recent views (4), (6), (18), (21) on underlining. A lively discussion ensued when the instructor disclosed a note attached to the questionnaire of one of the students, reiterating her "personal philosophy about underlining." (See APPENDIX.)

RESULTS AND DISCUSSION

Table 1 reveals that while a greater difference between Pre and Post Underlining measures was shown in the SS/Science area than in Reading, there was no statistically significant difference obtained in either course. Thus, both Null Hypothesis 1 and 2 were substantiated.

TABLE 1
Mean Differences in Pre and Post Underlining of Students in Education 361 and 342

		Pre		Post			
Course	N	Mean	S.D.	Mean	S.D.	t	p
Reading	30*	65.17	19.75	65.53	23.71	0.149	NS***
SS/Science	28**	70.04	15.17	68.46	14.28	1.015	NS***

* df = 29 ** df = 27 *** Not significant at .05

Table 2 presents the coefficient of correlation between the amount of underlining and grade point averages for students in each of the two courses. As can be seen, a low positive correlationship of .20 exists between the amount of underlining in reading and grade point

TABLE 2
Pearsonian Coefficient of Correlation Between Amount of Underlining in Education 361, Education 342, and Grade Point Averages

		Post UNDL		GPA		
Course	N	Mean	S.D.	Mean	S.D.	r
Reading	30	65.53	23.71	2.70	.63	.20
SS/Science	28	68.46	14.28	2.63	.41	.51

averages; while a medium positive correlation of .51 exists between the amount of underlining in social studies/science and grade point averages.

It is of interest here to note the relative performance of the student's underlining in social studies as compared with that in science. Table 3 shows the relationship between the ranks in both areas. The analysis revealed a rank difference correlation of 0.457 or .46, or a medium low positive correlation. While this finding is not ideal, it is indicative of greater possibilities when controls are used, and when the subjects are aware of the fact that they are engaging in research investigations.

TABLE 3

Spearman Rank Difference Correlation Between Students' Underlining in Social Studies and Science

N	Post SS	Post Science	Rank SS	Rank Science
1.	104.00	84.00	1.00	2.00
2.	101.00	79.00	2.00	10.50
3.	97.00	67.00	3.00	16.50
4.	96.00	84.00	4.50	2.00
5.	96.00	81.00	4.50	6.50
6.	95.00	80.00	6.00	8.50
7.	88.00	80.00	7.00	8.50
8.	85.00	70.00	8.00	14.50
9.	73.00	84.00	9.50	2.00
10.	73.00	53.00	9.50	22.00
11.	72.00	79.00	11.00	10.50
12.	71.00	81.00	12.00	6.50
13.	69.00	48.00	13.50	24.50
14.	69.00	46.00	13.50	26.50
15.	67.00	64.00	15.50	19.00
16.	67.00	46.00	15.50	26.50
17.	64.00	59.00	17.00	20.50
18.	62.00	67.00	18.00	16.50
19.	59.00	83.00	19.00	4.50
20.	53.00	78.00	20.50	12.50
21.	53.00	44.00	20.50	28.00
22.	51.00	78.00	22.00	12.50
23.	50.00	83.00	23.00	4.50
24.	49.00	70.00	24.00	14.50
25.	47.00	59.00	25.50	20.50
26.	47.00	48.00	25.50	24.50
27.	41.00	65.00	27.00	18.00
28.	40.00	52.00	28.00	23.00

Rank Difference Correlation = 0.457 = .46

There has been some speculation that students tend to do more underlining in their textbooks during the first part of a course than in the latter, indicating a possible waning of interest. It was partly for this reason that specific assignments were made covering the random sample of pages. As has been seen, analysis of the data revealed no statistically significant difference in the amount of underlining done during the first and latter half of the Summer Term in either course. In addition, returns from the questionnaires yielded a moderate degree of consistency in their answers and the amount of underlining actually done in their books, i.e., those who checked the blocks indicating "Almost Always" or "Frequently," most nearly did so, and vice versa. (See Questionnaire in APPENDIX.)

The greatest discrepancy was shown in the matter of preferences for marking key words and phrases as well as main ideas. For example, several listed that they preferred to use brackets and circles, when, in fact, they merely "placed a horizontal line underneath those words." Color preferences, however, were consistent in that those who listed their choices of highlighters actually underlines using them. A few *overunderlined,* and it was difficult to tell where the important points began and ended.

In view of the fact that reading is the key to other areas of the curriculum, it was somewhat disappointing to discover a lower correlation between the amount of underlining in reading and grade point averages than between SS/Science and grade point averages. Perhaps is can be said that the area of human relations, differences in newer and traditional trends in teaching of science and focus on our men on the moon provided greater impetus for study than did a presentation of the skills and frills in reading. The variables are many. However, since no attempt was made to teach underlining, and the purpose of the study was not revealed to the students during the term, the results provided some useful implications:

1. Underlining *is* practiced by students in education courses as a study technique.
2. Some degree of relationship exists between the amount of underlining as a study technique and Grade Point Averages.
3. Systematic instruction in the technique of underlining is needed to help students get more out of their textbooks.
4. The need for more and varied research in the area is evident.

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APPENDIX

Educ. ______________________ ______________________
Course Textbook

On Studying a College Textbook

Circle the letter representing the best description of yourself as you have been doing within this 8 weeks Summer Session.

A —Almost always (85-100 per cent of time)
F —Frequently (50- 85 per cent of time)
S_1 —Sometime (15- 50 per cent of time)
S_2 —Seldom (0- 15 per cent of time)

A F S_1 S_2 1. I use some form of underlining while studying.
A F S_1 S_2 2. I make marginal notes in my textbook.
A F S_1 S_2 3. I underline main points, key words, phrases, and sentences as I read.
A F S_1 S_2 4. I underline main points, key words, phrases, and sentences after an initial reading.
A F S_1 S_2 5. I make such listings as first, second, third; one, two, three; or a. b. c for main points, details, or examples.

Number each box in the order of preference in a system of marking textbooks: My choices of textbook markings for main points, key words, or phrases are as follows:

☐ brackets; ☐ circles; ☐ stars; ☐ letters;
☐ numbers; ☐ arrows; ☐ checks; ☐ underlines.
☐ List: ______________, ______________, ______________.

Annotations or Marginal Notes:

A F S_1 S_2 1. I write a question evoked by the paragraph.
A F S_1 S_2 2. I write a few words to characterize the function of the paragraph.
A F S_1 S_2 3. I write a brief summary of the content of the paragraph.

Color Preference in Textbook Markings:

A F S_1 S_2 1. I use the same color of pen or pencil when I underline.
A F S_1 S_2 2. Main points are marked in one color.
A F S_1 S_2 3. Supporting details are marked in a contrasting color.
A F S_1 S_2 4. Examples are marked in still another color.

APPENDIX

The questionnaire, On Studying a College Textbook, administered on the next to the last day of class, no doubt, prompted these student responses:

Number 1

Mrs. Adams,

I have refrained from underlining in this book because I am borrowing it from the Rockford College Library in Rockford, Ill. I thank you.

Grace Nicoloci
Educ. 361
Mrs. Adams

I normally underline when I read.

Number 2

Mrs. Adams—

Just a note to explain my personal learning philosophy concerning textbooks. I dislike underlining because it seems to me to be both distracting and sloppy. I prefer outlining and taking notes.

Melodie Gay

Number 3

I do not underline or otherwise write in my textbook because:

☐ I plan to re-sell the book. ☐ I don't think it is proper.
☐ Other reason: ____________________

If a book is already underlined I use contrasting ink. If I am sure I will be re-selling the book I make notes in another notebook rather than in the text.

Assessing Teachers' Attitudes Toward Individualizing Reading Instruction*

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PURPOSE OF THE INSTRUMENT

The Reading Teacher Survey was created to measure attitudes of elementary school teachers toward individualizing reading instruction. It was designed specifically for use during the 1968-69 school year, as part of a larger study, to determine if changes in attitudes toward individualization occurred during the school year through the use of a program of diagnostic testing and reading instruction based on individual pupil needs.

DEVELOPMENT OF THE INSTRUMENT

Background.

It was anticipated that teachers might respond to an attitude inventory as they thought they should respond as teachers, and not as they actually believed. Therefore, an indirect method of assessing attitudes was selected—namely, the semantic differential of Osgood, Suci, and Tannenbaum (4). Since in using the semantic differential the subject rates a concept on adjective scales, it was hoped that the intent of the instrument would not be as apparent as with direct questionnaire.

Jackson and Messick (3) stated that "indirect, disguised techniques" are sometimes necessary to obtain a valid measurement of an attitude. Weschler and Bernberg (5), furthermore, pointed out some advantages of indirect methods of assessing attitudes—namely, that the subject is allowed to respond without fear of revealing personal feelings and that the experimenter can measure an attitude without affecting or changing it in the measurement process.

The semantic differential was chosen, therefore, as an indirect method of assessing attitudes. Osgood, *et al.,* have discussed the basic flexibility in using the semantic differential:

> Although we often refer to *the* semantic differential as if it were some kind of "test," having some definite set of items and a specific score, this is not the case. To the contrary, it is a

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> very general way of getting at a certain type of information, a highly generalizable technique of measurement which must be adapted to the requirement of each research problem to which it is applied. There are no standard concepts and no standard scales; rather, the concepts and scales used in a particular study depend upon the purposes of the research (p. 76).

Two adaptations of the basic semantic differential instrument, as described by Osgood, *et al.*, were made. First, analysis of the three factors found by Osgood, *et al.*—evaluation, potency, and activity—was not undertaken. It seemed more important in terms of the requirements of the study to choose scales appropriate to a unitary concept of attitude toward individualizing reading instruction rather than to try to measure separate factors.

The second adaptation of the semantic differential was the inclusion of the agree-disagree scale. The purpose of its inclusion was to determine whether subjects would tend to respond more positively to that scale than to the other scales which consisted of adjectives. It was speculated that they would tend to give answers they perceived as desirable (positive responses) on the agree-disagree continuum more often than on the other scales. This notion was in fact supported by the data.

Description of the 1968-69 Version

The original version of the Reading Teacher Survey was pilot-tested and revised twice before being used during the 1968-69 school year. It consisted of 96 items—i.e., 12 statements with 8 rating scales under each statement. The statements were examples of classroom situations, illustrating instructional procedures that would grow out of the assumptions of individualized reading instruction. One of the 12 statements or examples, representing a viewpoint opposed to individualization, was inserted to break a set toward positive responses.

Teachers, who did not sign their names, were asked to consider the feasibility of applying each of the 12 examples in their classrooms. They were instructed to record their responses on the eight rating scales following each example. The total score, then, was considered an indication of attitude toward individualizing reading instruction.

Seven of the rating scales consisted of adjectives picked from the adjectives used in the literature to describe individualized reading instruction. One additional scale provided a continuum of agreement-disagreement. The scales had seven positions, ranging from the positive to the negative extreme. The middle position could be used when the subject felt neutral or when he did not know how to respond. With the exception of asking the subjects to consider each statement in terms of their classroom experience, the instructions were otherwise modeled after those suggested by Osgood, *et al.* (pp. 82-84).

Revised Version

Since the 1968-69 version of the instrument did reflect a change in teachers' attitudes from fall to spring of the school year while using an experimental system of individualized reading instruction, it was decided to revise the instrument, retaining only the best items in the final version. Therefore, an item analysis program—Generalized Item Analysis Program (GITAP) by Baker and Martin (1)—was used to analyze the test data from the 17 subjects who had taken the 1968-69 version as part of the larger study. Each of the 96 items (i.e., each scale under each of the 12 statements) was analyzed both in terms of the correlation with the subtest score (the subtest being each statement or classroom example) and in terms of the correlation with the total test score.

Extensive revisions were made so that the instrument was decreased in length to 63 items or scales. One statement, or classroom example, was eliminated and one was rewritten, making a total of 11 statements or subtests instead of 12. The statement (#4)—presenting a situation opposed to individualization to break a positive response set—was retained since it proved to discriminate between high and low total scores. A sample classroom situation with adjective scales, which were not scored, was inserted after the directions so that subjects would fully understand what they were expected to do in responding to the inventory.

Particular rating scales under certain statements that did not discriminate between high and low total scores were also omitted; therefore, not all of the scales were used under each statement in the revised version—only the ones that had the highest correlations with total test score. One scale that proved to be ineffective—the dull-interesting continuum—was omitted, leaving seven scales in the revised version. The following statements and rating scales that were retained in the revised version are presented in Table 1.

TABLE 1
Statements and Scales Used in the Reading Teacher Survey
(Revised Version)

Statements:

1. Pete and Gary are among the best readers in their third-grade class. It is feasible for the teacher to know that Pete has trouble reading social studies books while Gary who has no trouble with factual material cannot understand non-literal material.

2. It is possible for the teacher to know that Dennis is poor in picking out the main idea of a paragraph but good at recognizing all consonant and vowel sounds.

3. Although Ruth is working in more than one set of materials to learn the short *a* sound, it is possible for the teacher to know which skill she should be taught next.

4. It is feasible for a second grade teacher to use the same 2-1 basal reader with the whole class.
5. It can be expected that a second grade teacher will know when and how to teach outlining skills to Gary who reads far above grade level.
6. It is feasible for Mary Lou, who has not mastered initial consonant sounds, to continue work on them although the rest of the children have mastered this skill and have moved on to new material.
7. It is feasible in a second grade classroom to provide Pete with fourth grade materials which he can read and to give Peggy pre-primer material which is appropriate for her.
8. Marjorie, David, Howard, Dorothy, and several others are working together in a small group on recognizing certain consonant blends. It is possible for the teacher to assess at almost every group meeting which children have mastered this skill and to modify teaching accordingly.
9. Jim does not seem to have much interest in reading in the basal reader. The teacher can effectively use non-basal materials to teach him reading skills.
10. Jim, Dennis, Gary, Ruth, and Pete all need work on the vowel dipthongs *oi and oy*. It is feasible to meet with this group once or several times, depending on the length of time needed for mastering these sounds in words.
11. Gary has mastered all the work taught to the class very quickly. It is feasible to allow him to start working on vowel digraphs even though the rest of the class is working on consonant blends and short vowel sounds.

Scales:

ineffective _____:_____:_____:_____:_____:_____:_____ disagree
challenging _____:_____:_____:_____:_____:_____:_____ effective
agree _____:_____:_____:_____:_____:_____:_____ unchallenging
disorganized _____:_____:_____:_____:_____:_____:_____ organized
practical _____:_____:_____:_____:_____:_____:_____ impractical
fair _____:_____:_____:_____:_____:_____:_____ unfair
inefficient _____:_____:_____:_____:_____:_____:_____ efficient

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The revised version was then given to 31 experienced elementary school teachers taking a course in developmental reading during the summer session of 1969 at the University of Wisconsin. The data were again analyzed by GITAP, but only very minor revisions were made.

The total number of possible points on the revised version was 441. The mean and standard deviation of the total test scores for the experienced teachers taking the revised version are presented in Table 2.

TABLE 2
Mean and Standard Deviation of Total Test Scores
(Revised Version)

Subjects	Mean	Standard Deviation	N
Experienced elementary teachers in summer school	383.55	36.22	31

Validity and Reliability

Content validity was demonstrated for the statements and rating scales of the first version. Three professors who teach courses in reading judged the statement and scales to be relevant to measuring attitudes toward individualization of reading instruction. The rating scales had further validity in that the adjectives were chosen from the literature describing individualized reading instruction.

The estimate of reliability or internal consistency (Hoyt reliability coefficient) of the 1968-69 version of the instrument was .90, as obtained from GITAP. The Hoyt reliability coefficient of the revised version, obtained from GITAP run on the data from the experienced teachers in summer school, was .93. Therefore, although the number of items was reduced from 96 to 63 in the revised version, the reliability was increased.

Green (2) has stated that a high reliability coefficient usually indicates that the items are homogeneous and the scales unidimensional. Since the reliability coefficient for the Reading Teacher Survey was high and since, therefore, the items were highly intercorrelated, the instrument was apparently measuring one factor as was intended instead of the three factors found by Osgood, *et al.* Presumably, this unitary factory was teachers' attitudes toward the individualization of reading instruction.

DISCUSSION

The advantages of the instrument are perhaps obvious. Teachers are allowed to respond anonymously to an indirect measure which does not obviously reveal the intent of the instrument. The inventory is easily scored, a high total score indicating a positive attitude toward individualizing reading instruction. It is quickly administered, taking no longer than 20 minutes. It may be administered to a group with the directions being read aloud, or it may be given to teachers to fill out in their spare time.

One limitation that this instrument shares with other attitude inventories, however, is the extraneous influence of the test administrator. If, for instance, the instrument was administered by a well-liked reading consultant, the scores might tend to be higher than if a person not directly concerned with the reading program administered it. Therefore, in using the instrument the effect of the test administrator should be evaluated beforehand.

Another limitation exists, also, in interpreting the scores. A score on any attitude inventory may not be considered as a true indication of behavior. A score on this instrument indicates only how the teacher *says* he would react to the stated classroom examples if they were applied in his classroom. It does not provide information about the procedures actually being employed during reading instruction in his classroom.

If these limitations are kept in mind, the instrument may be used in a variety of situations. A school administrator or reading consultant may wish to assess the attitudes of a group of teachers at a particular school or in an entire school system. If a new program of individualized reading instruction is going to be introduced into the school or system, it would be helpful to know how the teachers feel about individualizing reading instruction. If their attitude inventory scores were low, then additional inservice sessions should be spent in familiarizing teachers with the basic assumptions of individualized reading instruction. On the other hand, if scores were high, this preliminary work might be bypassed.

Another use of the Reading Teacher Survey is as an evaluative tool in research pertaining to elementary school reading programs. Many times an investigator wishes to consider the effect of an experimental reading program upon teachers' attitudes. This instrument, therefore, may be used in studies of individualized approaches to reading instruction. It would at least provide an indication of whether teachers reacted favorably or unfavorably to an individualized approach and philosophy of reading instruction.

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A Comparative Study of Reading Improvement Programs in Industry and Education in the United States and Canada

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In preparation for an address entitled "Speed Reading: Is the Present Emphasis Desirable?" at the Thirteenth Annual Convention of the International Reading Association in Boston in April, 1968, a questionnaire was composed to determine the existing situation regarding programs designed to increase reading rate. In the United States, the questionnaire was mailed to 225 commercial reading firms, whose addresses were obtained from the yellow pages of telephone directories of different parts of the United States; 372 college and university reading centers, as listed in the Lambuth College Directory (3); and 500 top corporations, as listed in *Fortune* (4).

The same questionnaire was mailed the following year in Canada to 25 commercial reading firms, 70 colleges and universities,* and 150 top corporations.

Of the 1,088 questionnaires mailed in January, 1968, in the United States, 292, or 27 per cent, responses were received; these included completed or partially completed questionnaires and letters from 45 states and the District of Columbia. Responses came from 53, or 11 per cent of the corporations[1]; 48, or 21 per cent of the commercial reading firms; and 191, or 53 per cent of the college and university reading centers.

Of the 245 questionnaires mailed in April, 1969, in Canada, 83, or 33.9 per cent, responses were received. The breakdown was 39, or 26 per cent of the corporations replied; 8, or 32 per cent of the commercial reading firms; and 36, or 51.4 per cent of the colleges and universities.

Because only a small portion of the data has been presented (1), the purpose of this paper is to record the data obtained from the questionnaire survey so that one may become familiar with the current status of reading improvement programs in the United States and Canada.

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* Questionnaires were sent to colleges and universities in Canada because there are relatively few Reading Centers in Canada in contrast to the large number in the United States.

[1] Respondents from many corporations noted that they refer employees to commercial reading firms, or to colleges and universities, instead of staffing a reading program.

The following questions and tables contain the essence of the questionnaire results:

DO THESE COURSES HAVE ANY PHILOSOPHY?

Various statements concerning philosophy of reading were included with returned questionnaires. Many of these statements were somewhat general (e.g., "reaching potential of students," etc.). Nevertheless, of the 180 U.S. responses and 36 Canadian responses to the statement, "we have a basic philosophy," respectively, 180, or 89 per cent, and 26, or 72.2 per cent, replied affirmatively. Table 1 indicates that commercial reading firms and colleges and universities in the U.S. and Canada tend to have philosophies.

HOW IS "SPEED READING" DEFINED?

The questionnaire contained the following statement to be completed: "A definition of speed reading that most clearly fits the objectives of our program is:". A multiplicity of responses was received, as indicated in Table 2. (The first five responses were listed on the questionnaire; the others were written in by the respondents.) As indicated, corporations, firms, and universities in U.S. and Canada prefer "efficiency of reading."

WHO TAKES THE READING IMPROVEMENT COURSES?

In the United States, the corporations tend to have a greater percentage of college educated adults, whereas in Canada they tend to have a greater percentage of high school graduates. Regarding the commercial reading firms, college educated adults are the largest market in both countries.

Of particular interest here is that a greater percentage of Canadian college students than U.S. college students take commercial reading courses; this pattern is also true among businessmen and professional people. One interpretation is that few Canadian colleges and universities have reading improvement programs. This interpretation is substantiated by the data indicating that in neither country do colleges and universities seem to service the reading needs of the general public including professional and businessmen.

HOW LARGE ARE THE CLASSES?

Table 4 reveals the range and median class size of reading improvement programs in U.S. and Canada.

WHAT IS THE TOTAL NUMBER OF HOURS SPENT IN CLASSROOM INSTRUCTION DURING THE WHOLE COURSE?

The corporations in the United States and Canada tend to have a similar median number of total classroom hours of instruction. The commercial reading firms in the U.S., however, have more total median hours of instruction than do those in Canada, and the colleges and universities in the U.S. and have considerably more total median hours of instruction than do those in Canada.

WHAT KINDS OF MATERIALS AND EQUIPMENT ARE USED?

A wide array of materials is used; respondents mentioned records, tapes, films, filmstrips, transparencies, overhead projectors, reading kits, accelerators, tests, tachistoscopes, workbooks, charts, maps, games, books, multi-sensory materials, manuals, and experience reports.

Machines are widely used. Some respondents, however, specified restrictions for such use, e.g., "during first three weeks," or "first twenty minutes of class time."

Table 6 indicates that the tachistoscope is the favorite for group instruction in U.S. and Canadian corporation; whereas, for individuals, controlled pacers are favored. Commercial reading firms and colleges and universities have a similar pattern to those of the corporations, with commercial firms making increased use of textbooks.

WHO TEACHES THE COURSE?

Table 7 reveals that 21 Ph.D. degree holders are actively involved in teaching these courses in the U.S. (mostly in universities), and 17 Ph.D.'s are so involved in Canada (all in firms).

IS VISION CHECKED?

Routine vision checks are reported in 94 programs in the U.S., and six noted that vision is checked when requested by student, parent, or teacher. Five commercial firms in the U.S. recommend a private eye examination for all students; one requires proof of a recent examination.

Approximately twice the percentage of U.S. commercial reading firms and colleges and universities have vision checks in comparison to the percentages in Canada.

WHAT KINDS OF INSTRUMENTS ARE USED TO CHECK VISION?

Table 9 indicates that the Keystone Telebinocular is the most popular instrument used to check vision in reading improvement courses.

IS THERE ANY PRE-TESTING OF READING SKILLS?

Pre-testing is reported by 95 per cent and 94.3 per cent, respectively, of those responding in U.S. and Canada. Over 90 different ways were mentioned. Tests indicated as most popular were *The Nelson-Denny Reading Test*, the *Cooperative English Tests, EDL Reading Versatility Tests,* and various forms of the *Iowa Silent Reading Test, Science Research Associates* (SRA) *Tests, Gates Reading Survey,* and teacher-made tests, including informal reading inventories.

Table 10 indicates that more than 90 per cent of the commercial reading firms and colleges and universities in U.S. and Canada give pre-tests. Regarding corporations, 73.8 per cent in U.S. and 100 per cent in Canada have pre-tests in their programs.

WHAT IS DONE IN THE LAST SESSION?

There appears to be a greater variety of activities occurring at the last session of reading improvement courses in corporations, commercial firms, and colleges and universities in U.S. Table 11 contains these data.

WHAT ARE THE RATE GOALS?

Respondents were asked to complete the following statement: "The reading rate that we have as a goal for our students is:" Specific rates mentioned ranged from a minimum of 25 wpm to a maximum of 18,000 wpm. The median of the minimum was 600; the median of the maximum, 900. Many respondents chose to qualify the above rates by specifying the types of material for which a particular speed was intended, such 600-900 wpm for newspapers or popular magazines, 300 wpm for textbooks. Others stated a rate and added "for skimming only." Many chose not to set a specific numerical rate; 29 respondents preferred an individualized rate. Some specified that basic reading skills must have reached an acceptable level before there could be any stress on rate. Many preferred to state the rate goal in terms of doubling or tripling the starting rate while some stated the aim was only for improvement of rate. Further qualification came from those who stressed that speed is variable and must be adjusted to individual skills, material, and purpose. In Canada, goals in corporations and colleges and universities did not exceed, respectively, 900 and 1500 wpm. The goal was 5,000 words a minute for one commercial reading firm in Canada.

ARE THESE GAINS MAINTAINED AFTER STUDENT HAS LEFT THE CLASS?

Generally, respondents indicated that gains are maintained. They cited follow-up studies, post-testing months after course completion, or conferences with students, parents, or teachers.

HOW IS RATE MEASURED?

Most respondents measured rate by "number of words per minute" while some used "number of words dealt with per minute." The Effective Rate, which is referred to as the Reading Index by the Educational Development Laboratories (EDL) and others, is also used. Other ways indicated by individual respondents included "number of pages read in a given time," "percentile on the Iowa Test," "percentile on the Cooperative Test," "time to read a given chapter," "time to read an entire book," "reduction of time spent on reading," "maintenance of comprehension at an 80 per cent level or speed is not stressed," and the use of "gross and effective rates." A few said they did not measure rate. No respondent mentioned measuring rate by number of syllables. Table 13 provides information on rate measurement.

WHAT ARE THE COMPREHENSION GOALS?

Respondents generally expressed concern for adequate comprehension. The majority of programs in U.S. and Canadian corporations, commercial reading firms, and colleges and universities aim for 70 to 90 per cent comprehension.

Some respondents indicated that comprehension varies with individuals, materials, and purpose. Ways of measuring comprehension included quizzes, standardized tests, teacher-made tests, group discussions, outlines, summaries, and major ideas.

IS ANY RELATIONSHIP MADE TO STUDY SKILLS?

More emphasis is placed on study skills in reading improvement programs in Canadian corporations, about the same emphasis is given in commercial reading firms in both the U.S. and Canada, and more emphasis is given in U.S. colleges and universities, as indicated in Table 15.

CONCLUSION

The findings of this survey are in line with those obtained in the survey made by Geerlofs and Kling (2). It is encouraging to observe certain practices. One is the use of the vision check. Another is the use of more formal testing procedures before and after instruction. A third practice that is encouraging relates to the cooperation extended by corporations, commercial reading firms, and colleges and universities in providing information about their programs for this study. Cooperation of this nature will lead to increased communication, and through communication there will come a clearer understanding of the problems and the realization of their solutions.

One area of neglect revealed by this survey concerns the general public. Relatively few colleges and universities provide a reading improvement service for adults. This relative lack of service may in part reflect the current emphasis upon research and training in many institutions of higher education, contributing, perhaps, to the separation between "town and gown" in many cities.

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An Experimental Test of a First Grade Reading-Typewriting Program

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The current emphasis upon multimedia and computer-assisted instruction has prompted the design of the particular reading-typewriting program described here. In this instance, the computer was employed primarily as a program design tool. The program, produced by computer, was essentially a linguistic phonetic program adapted for the use of the typewriter as a teaching machine.

The structure of the program was progressive part, single phonetic unit block technique. (Bloomer, 1960) Here the child learned to read, type, and pronounce a single phoneme and its combination with preceding phonemes before moving to another phoneme.

Essentially, given an initial phoneme, the computer produced an optimal teaching order of phonemic elements based upon discriminability of sounds and orthographic shapes, as well as the frequency of occurrence of the phonemes. A further constraint on the phoneme selection was the finger with which the key is normally struck on the typewriter. Since the reading-typewriting program was designed for beginning first-graders, and the readiness program was built in as a part of the program itself, the initial typing done by the children was restricted to the index fingers on both hands. When the children had mastered the typing, as well as the reading, of words made up of the phonemic elements that can be pressed by the index fingers, the phonemic elements produced by the middle fingers were introduced. Again, these phonemes were presented in an order such that the discriminability between them was maximal. Thus, the child gradually worked from his index fingers to his little fingers, taking advantage of the increased coordination and sympathetic strengthening, and at the same time, learned to touch-type.

The program was designed in two phases: the first phase was a consistent phonetic program in which the children learned the short vowel sounds and the common sounds for the consonants. In the second phase, which is basically a second-grade program, the children first reviewed the first year's work and were given the consonant digraphs and the vowels in rule-situations.

EXPERIMENTAL DESIGN

The present experiment involved middle-class children in a suburban area of a large city in Texas. Two schools in the same district were involved. The children were assigned to two experimental classes on a random basis. Two control classes were also chosen at random. Both the experimental and the control teachers had taught an average of 5.2 years.

In the experimental classes, reading-typewriting was taught for two 40 minute periods a day; reading in the control groups was taught for two 40 minute periods a day. The typing class was taught collectively as a group although individual work was allowed and encouraged. Aside from the typewriters, the activities of the experimental first-grade classes were the same as those of normal classes.

Each child in the experimental group had an Olivetti-Underwood Lettera 31 typewriter which weighed eight pounds. The typewriters were usually kept on the side of the room; the children carried the machines to their desks when they were to be used.

The children also had their own workbooks, the pages of which were detachable, for the reading-typewriting program. The program consisted of 25 lessons, each one relating to a single phoneme. The letter "q" was not presented in the first year because of its occurrence only with the unusal sound of *u*. The children began each lesson by typing the new letter several times in isolation. Next, this letter was combined with previously learned letters; phonetic combinations in the form of biographs were then mastered. The children moved lastly to meaningful words before beginning to work independently with these words in construction sentences or identifying meanings.

In conjunction with the workbook of 25 lessons, there was also a primer which contained several phonetically consistent stories, composed only of phonetic elements which the children had already mastered. This book contained workbook exercises to accompany each of the 20 stories.

The children from the control and experimental classes were tested at the end of the first year. The evaluative instruments were the Stanford Achievement Test, the Reading Skills Diagnostic Test (Bloomer, 1967), a phonetic spelling scale, a handwriting scale, and a typewriting test.

RESULTS

Table 1 shows the results of the experiment according to the Stanford Achievement battery (Campbell and Stanley, 1963). Significant differences in favor of the experimental group occurred for paragraph meaning, word study skills, and spelling. No differences were found in the other areas of the test battery.

The Reading Skills Diagnostic Test was used to determine the specific reading skills where differences occurred between the experimental and control groups. As seen in Table 2, both groups did equally well in the recognition of the letters of the alphabet. In simple phonics, the group using the reading-typewriting program was significantly superior. This should not be surprising since the reading-typewriting program in its linguistc form concentrated upon simple phonics.

TABLE 1
Reading-Typing Compared With Control
Stanford Achievement Test

Variable	Group	N	Mean	Standard Deviation	"t"*
Word Reading	Exp.	49	2.00	.49	
	Control	53	1.89	.60	NS
Paragraph Meaning	Exp.	49	2.08	.56	
	Control	53	1.91	.47	5.28
Vocabulary	Exp.	49	2.11	.63	
	Control	53	2.11	.59	NS
Word Study Skills	Exp.	49	2.41	.65	
	Control	53	1.86	.62	4.40
Spelling	Exp.	49	2.20	.78	
	Control	53	1.95	.54	2.17
Math	Exp.	49	1.87	.42	
	Control	53	1.95	.35	NS

* t .05 w/w 100 df p = 1.99
t .01 w/w 100 df p = 2.37

However, the pupils using the reading-typewriting program were also significantly superior in complex phonics (words with vowel rules, or words containing diagraphs such as ch, sh, th). It should be noted that there was no teaching of these rules or diagraphs for the reading-typewriting group, indicating a significant amount of generalization form previous knowledge, or from the acquired simple phonics.

There were no significant differences in sight words. These words must be learned by sight since they do not fit the common English phonetic rules. Almost none of these words are included in the reading-typewriting program, but they are all highly frequent in the English language and are included in most reading programs. Although the control program had been presented with a large number of these words, the scores were none the less equivalent.

Spelling

The spelling test consisted of phonetically consistent words taken from second, third, fourth, fifth, and sixth-grade levels. Here the experimental group did considerably better as a result of increased ability to use their phonetics to spell words correctly.

HANDWRITING

With the amount of typing in the experimental classes, there was a de-emphasis of handwriting. One of the considerations of the experiment related to the effect of a large amount of typewriting on the handwriting of the children. Essentially, there proved to be no effect, in that experimental and control groups did essentially equally well on the Zaner-Blosser Handwriting Test as evaluated by independent judges.

DISCUSSION

There were several interesting outcomes of the experiment. First, no child had any difficulty with the left to right progression. Left to right progression can be seen as a function of teaching sight words to children before the sequence in which the word should be read is built as a strong concept to the child. Since the typewriter allows words only to flow in one direction, it also serves to teach this particular concept to children. Thus, while teachers made no particular emphasis on left to right progression, no problems in this area occurred.

Another outcome of the experiment was the effect of the typewriter on the attention span of the children. The children, almost without exception, were able to sit for 40 minutes and concentrate upon typing. This attention span occurred partly because listening lessons were built into the typing lessons. The child consistently had to listen to the teacher to determine what would be his next stroke on the typewriter. The message he was to receive required his attention, and was relatively simple to decipher, in that it contained only new combinations of already learned material, rather than new material.

The effect of the experiment on over-all class behavior was also interesting. All the teachers using the program remarked on how rapidly the class settled itself. The problem of developing classroom order and routine, which often lasts for several months, was almost immediately resolved upon the introduction of the typewriter.

A fourth effect of the introduction of the typewriter into the reading program was the speed with which the children were able to type. From the first stroke on the typewriter, a child is able to produce printed material faster than he can read. At the end of the year, children copying unfamiliar second grade material typed at an average of five words a minute, the faster child doing 21 words a minute.

Because the typewriter makes material extremely legible, the children were able to read their own work. Further, since they wrote their personal stories on the typewriter, they are able to read them at a future time when their own handwriting might well cause them considerable confusion.

The typewriter allowed the children a considerably greater amount of freedom because of both the writing speed and the clarity of the produced material. Writing large numbers of personal experience stories, the children were thus able to individualize the program in relation to their own wants and needs. The phonetic nature of the program was also a distinct advantage in producing independent readers. The usual basal reading program introduces some four to five hundred words in the first year. However, in the reading-typing program, a child may increase his reading vocabulary by nearly four hundred words in one week's lesson. Basically, if a child is able to say the word, he is able to read it, and to make a very respectable attempt at typing it. Hence, the child's variability and independence in reading and writing is markedly increased.

SUMMARY

Two classes of randomly assigned children were given an experimental form of a reading-typewriting program with one typewriter for each child. The experimental group was significantly superior in paragraph meaning, word study skills, and spelling on the Stanford Achievement Test, and in simple phonics, complex phonics, and spelling on the Reading Skills Diagnostic Test. In addition, the children in the experimental group had no left to right progression problems, exhibited much variety in writing, and considerably greater independence in reading. Classroom performance was affected in terms of an increase in listening skills and attention span.

CONCLUSIONS

The experiment shows that in addition to producing reading skills, the use of the typewriter in the classroom has a large number of additional positive side effects in terms of writing and attention span, as well as in a reduction of reading problems.

TABLE 2
Reading-Typing Program Compared With Control
Reading Skills Diagnostic Test

Variable	Group	N	Mean	Standard Deviation	't'*
Letter Recognition	Exp.	49	50.34	1.57	
	Control	43	49.79	3.72	NS
Simple Phonics	Exp.	49	48.20	3.07	
	Control	53	42.57	7.51	5.04
Complex Phonics	Exp.	49	34.89	6.26	
	Control	53	29.61	7.28	3.94
Sight Words	Exp.	49	80.12	11.79	
	Control	53	78.83	7.18	NS
Spelling	Exp.	49	12.41	4.84	
	Control	53	5.38	4.70	7.92

*t .05 w/w 100 df p = 1.99
t .05 w/w 100 df p = 2.37

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Semantic Constructs and Beginning Reading*

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Several investigators have reported the results of their efforts to determine the relationship between young non-readers' concepts and attitudes about reading and their subsequent achievement in learning to read early or their later success in reading.

Almy (1940), for instance, reported research data describing the reading and reading-related experiences of 106 children prior to first grade and their subsequent degree of success in learning to read. Parents reported to her that most of their children were interested in reading and asked to be read to. They used reading materials in their play, pretended to read, noted signs, and were interested in printed words and letters. Comparisons between the experiences of the thirty best readers and thirty poorest readers indicated to Almy that personal experiences with reading were the best means for developing readiness for learning to read.

Durkin (1958) also gathered data through parent interviews. She reported that children who learned to read before receiving school instruction had become interested in reading at very early ages. All the children in her sample had been exposed to reading materials in their immediate preschool environments and had asked repeated questions (which were answered) about books, words, letters, and reading.

On the other hand, several investigators have attempted to make use of child interview data. Brumbaugh (1940) reported the results of interviews with seven hundred kindergarten children. She found that one half the children expected to read in grade one. One half the children thought learning to read would be a difficult experience, and one third thought it would be easy.

Weintraub and Denny (1965) interviewed beginning first graders. They stated that one-fourth of the children in their sample could not verbalize an intelligible description of the reading act. The descriptions voiced by the other three-fourths of the children were mostly descriptions of reading oriented objects.

Later, Denny and Weintraub (1966) asked 111 first graders whether they wanted to read, why they wanted or did not want to learn

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to read, and what they must do to learn to read. More than one-fourth of the children could not express a reasonable purpose for learning to read, while one-third had no idea how learning to read was to be accomplished. Fifty-three percent of the children who did not attend kindergarten could not make responses relevant the the questions.

Reid (1966) reported the results of structured interviews with twelve five-year-old children during their first year of learning to read and write. The purpose of his study, however, was not to discover concepts about learning to read but to determine the level of concept formation as it was embodied in the childrens' vocabularies and to follow the growth of these concepts. Although the childrens' general concepts about reading were vague initially, their general achievement seemed to depend on whether or not they had the necessary vocabulary that would enable them to acquire new schema about the reading process.

Keshian (1963), Sutton (1964), Plessas and Oakes (1964), and Mason (1967) reported findings about early readers very similar to those reported by Durkin and those reported about successful beginning readers by Almy. These reports were either descriptions of the characteristics of successful readers or the results of interviews with young children beginning to learn to read. The subjects in Mason's study, however, were three-, four-, and five-year-old children just beginning to receive early reading instruction.

None of these researchers seem to have been actively seeking an explanation for the relationship between the child's interest in books and reading, his knowledge about the reading process and how it is learned, and his success in learning to read. They have merely demonstrated the existence of the relationship. One investigator, however, seems to believe that the conceptions of the child exert a great influence upon his success in reading.

Edwards (1958) interviewed poor readers in grades two, three, and four. He attempted to determine what concepts of reading they held at first grade entrance and what concepts about reading they had acquired since that time. He concluded that first experiences with reading frequently lead children to develop false concepts about reading. Later Edwards (1962) concluded that many teachers are aware that children have the wrong concepts about reading. He suggested that proper reading concepts be developed by encouraging the child to discuss the "whys" about reading and what is expected of the beginning reader.

To summarize previous research efforts, we can state that they have been of three kinds: descriptions of pre-reading experiences, descriptions of characteristics and concepts of successful and non-successful readers, and investigations of the concepts and attitudes toward reading held by beginners and children not yet able to read. All of these efforts imply a belief that pre-knowledge about reading has a direct effect upon success in learning to read. Yet no theory or explanation as to the exact manner in which this effect makes its impact has been set forth.

One possible explanation can be derived from a construct advanced by Hayakawa (1949). In this construct the individual is conceived as living in two worlds. His *extensional world* is learned through his own direct experiences. His *verbal world* is slowly constructed through direct experiences and vicarious experiences communicated by observation, conversation, and other communications media. Verbal information is stored for reference in situations not previously directly experienced. When referred to, it acts as a sort of *language map* which relates to the extensional world exactly as a map relates to unknown or unremembered territory.

If the individual acquires a language map that corresponds closely to the extensional world, he is not in danger of being shocked. His language map is an expectation of reality. However, if his map is a false one, he will be confronted with unexpected reality. When this occurs, he will waste a great deal of time and energy in attempting to force the extensional world to change so that it is represented by his map and/or he may resist attempts to get him to enter the real extensional world. In either event, his learning of reading will suffer.

The existing investigations have been attempts to elicit children's language maps of the reading area. When children state that they expect to read in grade one, they are stating that "reading" is recorded on their language maps of grade one. Their interest in asking of questions about reading can be interpreted as attempts to add detail to existing language maps of some vaguely defined territory called "reading." Early exposure to reading materials and their experiences in hearing stories read aloud can be seen as opportunities for beginning the construction of language maps about reading. By reexamining earlier research efforts, we can hypothesize that most successful readers had developed very adequate language maps of reading before they learned to read.

The problem remaining is the purpose of this investigation: to determine whether children's semantic constructs—their language maps—are sufficiently involved in the acquisition of reading skills to be predictive; to determine whether the prediction correlation between language maps and reading achievement is greater than that correlation expected by chance; and to determine whether an instrument attempting to quantify the accuracy of a "language map" can be a reliable instrument with which to assess the semantic constructs of young children.

Procedure

The Individual Reading Interest Survey (IRIS), consisting of forty-two questions requiring a verbal response, was administered to fifty-two beginning first grade children in Thonotosassa, Florida and 143 three-, four-, and five-year-old children attending classes at the Clayton County Project of the University of Georgia Research and Development Center in Educational Stimulation. The former group was made up of disadvantaged rural children. The latter comprised a stratified sample, representing the socio-economic distribution, racial composition, and rural classifications of the United States.

IRIS questions were constructed to yield inferences about each subject's language map of reading as revealed by his present knowledge about and interest in reading.

The Kuder-Richardson Formula 20 reliability indices for the IRIS indicate that the instrument can be considered a reliable one for the groups tested. This is especially true when one considers the extreme difficulty in obtaining test reliability for children this age.

The only validity, however, which can be established for such an instrument with very young children is face validity.

Means and standard deviations of MRT and MAT scores of the six-year-old subjects and WRAT scores of the three-, four-, and five-year-old subjects are presented in Tables 2 and 3.

TABLE 1

Means, Standard Deviations, and Reliabilities for the Informal Reading Interest Survey Results of Three-, Four-, Five-, and Six-year-old Children

Age	$\bar{X}$	SD	K-R Formula 20 Reliability
3	16.90	6.76	.874
4	17.73	5.03	.771
5	20.31	4.87	.720
6	38.13	3.00	.710

TABLE 2

Means and Standard Deviations of Metropolitan Readiness Test and Metropolitan Achievement Test of Six-year-old Children

	Metropolitan Achievement Test			Metropolitan Readiness Test
	Word Discrimination	Word Knowledge	Reading Comprehension	
X	12.50	12.29	13.21	40.85
SD	6.29	5.40	5.23	15.13

TABLE 3
Means and Standard Deviations of Wide Range Achievement Test Scores of Three-, Four-, and Five-year-old Children

Age	N	$\bar{X}$	SD
3	50	3.48	2.81
4	45	5.20	6.18
5	48	10.90	11.60

Table 4 presents the Correlations between the IRIS and the WRAT score of the three-, four-, and five-year-old children.

TABLE 4
Correlations Between Informal Reading Interest Survey and Wide Range Achievement Test Scores of Three-, Four-, and Five-year-old Children

Age	N	Correlation Coefficient
3	50	.11
4	45	.23
5	48	.45*

* Sig. at .01 Level

It is interesting to note that the only significant correlation between IRIS scores and WRAT scores is that found among the scores of the five-year-old children.

Table 5 shows correlations among IRIS, MRT, and MAT scores and age in months of the six-year-old subjects.

TABLE 5
Inter-Correlations Among Informal Reading Interest Survey, Metropolitan Readiness Test, and Metropolitan Achievement Test Scores and Age Among Six-year-old Children

	1	2	3	4	5	6
1. Informal Reading Interest Survey	1.00	.31**	.29**	.20	.30**	.26
2. Metropolitan Readiness Test		1.00	.59*	.44*	62*	.17
3. Metropolitan Achievement Test Word Discrimination			1.00	.61*	.39*	.10
4. Metropolitan Achievement Test Word Knowledge				1.00	.48*	.03
5. Metropolitan Achievement Test Reading Comprehension					1.00	.18
6. Age						1.00

* Sig. at .01 Level
** Sig. at .05 Level

It can be seen that the fall IRIS scores correlate significantly with fall MRT scores, and with spring MAT word discrimination and reading comprehension scores; however, the correlation between IRIS scores and MAT scores do not reach the magnitude of those between MRT and MAT scores.

Partial correlations between IRIS, MRT, and MAT scores were computed, eliminating the contribution of MRT scores and/or age to the correlation coefficients obtained. These partial correlation coefficients are depicted in Table 6.

TABLE 6
Partial Correlations Between Informal Reading Interest Survey, Metropolitan Readiness Test, and Metropolitan Achievement Test Scores of Six-year-old Subjects When Age and/or Metropolitan Readiness Test Scores are Partialed Out

	Age Constant	MRT Readiness Test Constant	MRT Test and Age Constant
Metropolitan Readiness Test	.28**		
Metropolitan Achievement Test Word Discrimination	.27**	.13	.14
Metropolitan Achievement Test Word Knowledge	.20	.07	.08
Metropolitan Achievement Test Reading Comprehension	.26	.14	.12

** Sig. at .05 Level

When the effects of age are held constant, the correlations between IRIS and MRT and MAT word discrimination scores remain significant. This indicates that age in and of itself is probably not a contributor to the relationship between these scores. Rather, it would appear that age simply provides the opportunity for the development of both skills tested by the MRT and MAT word discrimination test and the concepts revealed by IRIS scores.

The partialling out of MRT scores reduces the correlation between IRIS and MAT word discrimination scores to a non-significant magnitude. This would seem to indicate that language maps should be considered similar to readiness, tests in terms of their prediction of the later acquisition of reading skill.

CONCLUSIONS

Any generalizations based upon this investigation must be considered preliminary in nature. However, within the limits of the populations studied a few conclusions can be stated.

A reliable measure which attempts to sample young children's language maps of reading and learning to read has been constructed. The validity of the instrument is not and perhaps cannot be established.

There is a positive relationship between the completeness of six-year-old children's language maps and their scores on reading readiness tests. At the same time, a positive relationship exists between later word discrimination ability measured by reading achievement tests. It should be pointed out, however, that a relationship of greater magnitude exists between reading-readiness and reaching achievement.

A positive relationship also exists between the language maps of very young children and their scores on later reading achievement tests. Although the relationship is positive, it is significant only for the five-year-old children.

IMPLICATIONS

There are three major implications of this research and the related studies reviewed. Since the accuracy of children's semantic constructs about reading seems to be related to reading readiness and success in learning to read, it would appear that parents and teachers should make known to their listeners more about the process they employ when reading. Secondly, the initial steps in learning to read should be met with success in order to insure that the learner's desire and interest in learning to read are reinforced. Third, a child's language map of reading is different from those acquired skills which are measured by conventional reading readiness tests. This map is also related to later reading achievement. Consequently, teachers of beginning reading should not only test the reading readiness skills but also ascertain what information and beliefs about reading are held by their students before blindly plunging into reading readiness activities or reading instruction.

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1969 Review of Research on College-Adult Reading

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The great majority of reports included in the present review of research in college-adult reading are ones which have appeared since September, 1968, the time of preparation of last year's review (14), through September, 1969. Several previous reports which were in sources not available to this reviewer sufficiently earlier to have been included before (e.g., 135) and a few which were found to have been overlooked previously have also been included. As in previous years, a noticeable number of reports included were presented at the previous year's annual meeting of this Conference and were published in the Yearbook of the Conference (144).

The number of reports found relevant for this annual review, a total of 180, continued to be considerable and was approximately the same as the number for last year. Each of the various reports has again been treated under the five major headings indicated; and, also again, the ones included have rather consistently been restricted to those which included, involved, or seemed to have a somewhat direct bearing on, college students and/or other adults.

PROGRAMS

Colvin (38; 39; 40; 41) presented a series of reports in 1967 and 1968 on trends in college reading programs in Pennsylvania revealed by responses to a questionnaire survey carried out to determine what changes had occurred since Colvin's 1957-58 doctoral study survey. Approximately half the 78 colleges and universities responding replied that they were conducting college-level reading programs, a small decrease from 1957-58, with a definite majority offering voluntary, non-credit programs, for durations of seven to twelve weeks, with fees ranging from less than $29.00 for 38 per cent of the schools to charges of over $50.00 in 15 per cent. The most popular or frequently used tests were found to be, in order, the *Nelson-Denny Reading Test, The Iowa Silent Reading Test, The Cooperative English Test* (Test C2), and *The Diagnostic Reading Test.* Programs averaged less than twenty students per class in a majority of schools; increased use of "hardware," or mechanical devices, was noted; staffing of programs with one or two instructors was found to be the "overwhelming pattern." Course evaluation studies had, in general, not been carried out; but over 80 per cent of schools reporting felt that the courses had achieved their objectives.

Gray (65) utilized questionnaire data in his survey study of origin and development of college and university reading clinics in the United States. Among findings more pertinent for the area of college and other adult reading was that of those colleges reporting the limiting of enrollment to college students 65 per cent had been established only within the past twelve years (with almost the same proportion of those reporting having unlimited enrollment also having been established in the past twelve years). Examination of objectives of clinics indicated that these were more concerned with the diagnosis of children and clinical training and practice of graduates and undergraduates than for speed increase programs.

A considerable number of reports involved reading and/or study skills programs in some way. (4; 5; 8; 12; 18; 21; 23; 26; 31; 42; 45; 46; 48; 51; 58; 62; 68; 73; 79; 82; 84; 86; 88; 89; 90; 100; 103; 104; 125; 131; 136; 138; 149; 154; 155; 156; 157; 162; 164; 166; 167; 171; 174; 178) Descriptions of specific programs were presented or involved in a goodly number of reports, although not entirely or even mainly in many. (E.g., 4; 8; 23; 46; 48; 58; 62; 73; 82; 86; 90; 136; 149) Test score data of various types were presented for a number of programs, with statistical tests of significance having been indicated in some reports (e.g., 5; 12; 18; 21; 31; 42; 51; 68; 84; 88; 103; 136; 138), but not indicated in many others. Improvement of reading and study skills of participants was shown by test score gains in a number of programs (e.g., 4; 21; 31; 58; 84; 90; 136). Ahrendt and Chronister (4) reported that "all of the students showed some improvement" in rate and comprehension in University of British Columbia programs. Groups of Air Force retrainees increased significantly in reading speed scores after having participated in Perceptual Development Laboratories "advanced reading program" for twenty-six one-hour sessions. (21) Various test score gains were also reported for participants in programs conducted by Fordham University (31), Ferris Institute (58), Lafayette College (90), and the Reading and Study Skills Center at the University of Minnesota (136). Bowman (18), Keetz (88), and Kelly and Mech (89) were among those reporting that no test score gains were achieved in programs. Other programs where test score gains were achieved were those reported by Brown (23) and Shanberg (49).

Other or additional criteria were involved in evaluations in a number of other programs with academic achievements in terms of grade-point average a criterion in a number. (42; 79; 86; 89; 138; 154; 178) Hultgren and Crewe (79) found that over three-fourths of student athletes participating in a University of Minnesota program exceeded predicted end-of-year grade-point averages, with higher group grade-point averages than the average for all male freshmen. Karlstrom (86) reported that nine of ten students who had participated in an "intensive workshop" on study skills had raised their grade-point averages sufficiently at the end of the semester to remain in school. While Kelly and Mech (89) found "no indication" that a group of Washington State University reading program participants had made improvement in reading performance, they did find a "trend" toward a relationship between attendance and grade-point-average gain. Science, mathematics, and elementary education majors who participated also show significantly higher grade-point averages after three semesters than did a group of corresponding majors who had not been enrolled. Stevens (154) reported that a check with achievement in subject areas indicated that skills required by participants in a program were being used in an effective manner. Regensberg (138) found no significant differences between grade-point averages of an experimental group of Rutgers freshmen who had participated in a reading improvement course and control groups who had either been denied admission to the course or who had been urged to participate and had chosen not to. Wilson (178) also found no differences in academic achievement of University of Mississippi liberal arts students who had taken a course in effective study and a matched group of students who had not taken the course.

Colvin (42) found an experimental group of freshmen who scored below the median on a reading test and had then received formal treatment in a reading and study skills course did not make significantly greater gains in reading test scores by the end of the program, nor significantly greater first-semester grade-point averages, than did a control group of freshmen who had not participated. Colvin suggested that gains made by groups, while not significantly high, might well be deemed "noteworthy" when considering the extent to which a comparison control group might have become "contaminated" by the fact of an experimental group.

Several further comparisons of program groups and other groups were also reported. Among findings in a study involving participants from a University of Cincinnati reading and study course (5) were significant differences in reading test scores between persisting volunteers and non-voluntary enrollees, but no significant difference in college graduation status between persisting volunteers and voluntary enrollees who dropped out, when the groups were matched on bases of sex, age, college and major field.

"Flexible" and "inflexible" readers (MacDonald and Zimmy's *Appraisal of Reading Versatility* scores) participating in a San Francisco State College reading program differed significantly on comprehension, but not on reading vocabulary, score gains. (18) When Keetz (88) made various comparisons between an experimental group who had been required to take a reading and study skills course and a control group who had not been permitted to enroll in the course, she found no significant differences between the groups in *Davis Reading Test* scores, various study ability scores, or academic achievement in courses. Swindle (162) found no significant differences in academic achievement, in general, between students who had pursued a techniques-of-learning course and those who had not. Significant differences were found between military students who had participated and those who had not and in attrition rates of students who had pursued the course and those who had not.

Stevens and Adams (155) found the increase in reading speed of a myopic group of Vanderbilt engineering students enrolled in a reading course was significantly greater than the increase of an emmetropic group. A group of University of Montana students who had completed a remedial English course were found to have received higher grades in a composition course but had lower grade-point averages and fewer quarter hours and quarters completed than did groups of freshmen composition students who had not taken remedial English. (104) A majority of the students responded favorably to questionnaire items relative to remedial English, even though over three times as many felt they could have passed the composition course without the remedial course than felt they would have failed without the course. Magee (100) found that intensive instruction in phonics in a college study improvement course produced gains in phonics knowledge but did not seem to lead to gains in spelling skill.

Comparisons of methods were involved in a number of reported studies. (45; 48; 51; 103; 156; 164; 166; 167; 174) In a University of Minnesota elective study skills course, in which the study method used was underlining, a cramming group, which studied for two hours a day before an examination, received higher scores both on a first and second test than did groups who had studied at varying times before the examination and who reviewed no or varying numbers of times (45). Curry and Reynolds (48), in a study of effect of added practice sessions, varied according to amount, intervals, and frequency of practice, found least effectiveness was shown for a group for whom two hours of individual weekly practice on pacers was suggested only. About the same degree of effectiveness was indicated for a group which had one-and-one-half hours of weekly instruction and one-half hour of pacer practice and a group which, in addition to two hours of weekly group instruction, also practiced individually on pacers for two one-hour periods each week. DuBois (51) found groups of Northwest State College (Louisiana) freshmen in reading improvement classes, with subject-matter material specifically designed to improve textbook comprehension, and groups who used general reading materials intended for reading skill improvement both made significant gains in reading test scores, and significantly higher gains than did a control group but the two types of material groups did not differ significantly from one another. Both groups achieved higher scores on follow-up tests thirteen weeks later than they had on program post-tests. It was concluded that use of special subject-matter texts was not essential for improvement of textbook comprehension when general materials were used in a program (51). Both a treatment group of South Carolina State College students who had participated in experimental sessions devoted to transformational grammar and a second group devoted to completion cloze exercises made significant differential test score gains in reading, writing, listening, and recognition of linguistic structures; but the groups did not differ significantly in gains. Both groups made significantly greater gains in writing and listening, but not in English achievement, over a non-treatment group. (103) Stewart (156), using regular textbook material for approximately half a group of high school graduates enrolled in an eight-weeks English-mathematics institute, and cloze reading materials with the other half, found neither method more effective than the other. Taschow (164), comparing groups of community college students in corrective reading classes who received fifty 50-minute periods of intensive instruction over ten weeks and groups who received the same amount of instruction over twenty weeks, found the groups did not differ significantly in *Nelson-Denny Reading Test* score gains.

Studying the effectiveness of individualized group instruction with groups of "high risk" community college freshmen, Thelen (166) found individual and group treatment groups were, in general, not significantly different from control groups in application of study techniques. Trautwein (167), who compared a group of Augsburg College freshmen who had received instruction and practice in reading and study behavior in a required orientation course with an experimental group which had received instruction and practice in both the orientation course and a concurrent psychology course, found no significant differences between groups at the end of, and one semester after, the experimental period in various criterion measures of improvement in reading, study habits and aptitudes, and knowledge of subject matter taught in the orientation course. Weir (174) found New Mexico State University students in an effective reading and study course who had participated in three structured conferences the latter part of the course did not differ significantly at the end of the course in reading achievement, organization of ideas, and study habits and attitudes from a group of students who had participated in three unstructured conferences.

Pre-college reading improvement programs were involved in several reports. (68; 84; 189) Griffin (68), comparing groups of pre-junior-college students who were enrolled, prior to junior college entrance in the fall, in a summer orientation study skills and reading program, groups who enrolled for summer session but not for the orientation and skills program, and a group who had no collegiate experience prior to fall entrance, found no significant differences among groups in proportion of students who withdrew at intervals, in number of program changes, or in grade-point averages at intervals. Johnson and Jacobson (84) found significant gains in rate and vocabulary test scores (*Nelson-Denny*), but not comprehension, for two groups of college-bound high school reading enhancement classes. Shamberg (149) reported that test scores obtained over a period of four summers indicatd gains were made by participants in Western Reserve University pre-college programs.

Mostly adults from business and industry were enrolled in three semesters of reading training programs at the University of Toledo, as reported by Crowell, Gerjuoy, and Wendt (46). Improvement was indicated even for persons who dropped out after a few weeks; and, out of one-hundred-twenty-four persons who attended regularly, only fourteen had lower scores at the end of the tenth week than at the end of the second. Hastings (73) reported increases in pacer reading speed and in speed and comprehension on essay and film readings for twenty-five internal revenue executives participating in a reading improvement program conducted by Purdue University.

Railsback (131) described the use of automatic aural-oral techniques in a reading laboratory program conducted at Gary Job Corps Center. A survey conducted indicated that the average length of instruction time spent in the laboratory was 3.3 instructional months, with a reported mean gain in vocabulary development of .58 school years per instructional month and .65 school years for comprehension. In a study conducted by Papalio (125), a Passport to College Program group of youth with educational handicaps, after participating in a one-semester special program of reading and study skills, was compared with a comparison group and with male freshmen as a whole. Although the testing program involved, if any, was not clearly indicated, Papalio indicated that the Passport group had a lower rate of retention; and *Edwards Personal Preference Schedule* data comparisons suggested differences in "achievement" and "abasement" needs between the two groups.

Stewart (157) found both a standard workbook approach to literacy instruction and a programmed workbook approach to be effective in teaching functionally illiterate adults English as a second language, with no overall significant differences in reading ability produced by the two approaches. A significant difference in comprehension scores favored the programmed materials. Interview data gathered from participants in voluntary literacy programs conducted in Indiana (26) indicated that "a variety of circumstances and situations" were attributed causal roles in failure to learn to read and that achieving a high school diploma was only one of the factors which motivated participants in the programs.

To show "some of the potential for the direct modification of relevant school behavior in non-constrained adults" (171:226), Wark presented detailed case histories of four subjects who had participated in a University of Minnesota Extension Division "How to study" course in which attention was given to supervised individualized practice of a wide range of skills during half of each class session.

READING, STUDY, AND RELATED HABITS, TRAITS, AND SKILLS

A number of reports can be classified under the heading indicated for this section. Several studies dealt with the present or general status of skills of specific groups. (25; 33; 63; 80; 120) North (120) called attention to a "soon-to-be-pubiished" seven-year study by Lehmann and Hill which reportedly shows that today's college freshmen are better readers than freshmen of the past. When groups of University of Houston freshmen enrolled in special reading and study courses were compared with other freshmen by Bussell (25), it was found that a higher proportion of the latter group had ranked in the top fourth of their high-school classes. Gottlieb (63) cited some statistics obtained from background records of 100,000 male Job Corps enrollees to obtain profiles of "Losers," or "youth who were not making it." Among figures cited was a general reading score level of 6.7, although an average of nine years of formal education had been completed. Cline (33) obtained correlations of *Nelson-Denny Reading Test* scores of over 200 University of Colorado students enrolled in a required education course with various items or variables. Prospective senior high-school teachers were found more verbally skilled than were prospective primary teachers, with highest verbal skills being found in prospective English teachers. The group as a whole scored highest on rate (at the 70th percentile).

Another group of studies dealt with habits and traits, in general, of foreign (other than English speaking) groups. (2; 3; 74; 91; 101; 132; 150) Concern with literacy problems in other countries was expressed by several (91; 101; 132). Khater (91) reported a drop in illiteracy percentages in the United Arab Republic from 92.7 in 1907 to 77 per cent in 1947, which slow decrease was not up to expectations of a Literacy and Mass Education Act of 1944. Primary education enrollment had increased from about 33 per cent in 1952 to approximately 80 per cent in 1964. The 1960 census revealed an illiterate population of about 12,000,000 (69 per cent of the population, ranging from 50 to 75 per cent in urban and rural areas, respectively). Malmquist (101), in a paper presented at the opening session of the Second World Conference on Reading, cited figures based on information collected by UNESCO. According to these, approximately 40 per cent of the adult population of the world (800,000,000) has been estimated as being unable to read and write and 65 per cent as being below a functional literacy level (fourth-grade reading ability). Malmquist further pointed out that the illiteracy rate of 62 per cent of the member countries of the United Nations is over

50 per cent, with twenty countries having a rate of over 90 per cent and at least eight European countries having illiteracy rates of from 10 to 65 per cent. Rajguru (132) expressed some disappointment that, despite eighteen years of literacy efforts (and even after independence), only 24 per cent of the population of India was literate and that, of the nearly 36 per cent of children who have to be brought to school under a compulsory education enactment, nearly one-third end education at fifth grade and lapse into illiteracy because of absence of sustaining provisions.

Results obtained in an investigation by Adams (2) of readership habits and reactions to U. S. magazines of sixteen Latin-American and nine Texan seminar participants indicated high readership by Latin-American students, with the readers believing that the magazines generally were accurate in covering U. S. conditions but not in covering Latin-American conditions. Most consistent approval was given for treatment of educational conditions in both hemisphere sections; disapproval tended to be given (but not consistently) for treatment of social conditions. Effie Kaye Adams (3) obtained interest inventory responses from 300 UNRWA (United Nations Relief and Work Agency) secondary and teacher training institute male students in Lebanon. Responses obtained from teacher trainees indicated that they often enjoyed reading, spent from none to five hours in free reading daily, were encouraged to read by parents, owned from none to two-hundred books, and preferred books on politics, history, and romance. Hebron (74), in a study of failure rates of Rutherford College (England) overseas students (predominantly from Indo-Pakistani, Middle Eastern, and African ethnic groups), found overseas students showing significantly poorer levels of examination performance than did United Kingdom students, despite "favourable social conditions." When successful students only (those not weeded out by failure during the first and second years) were compared, they were still found to perform less well (but not significantly so), with seemingly no differences in performances of different ethnic groups or in language ability levels of successful overseas and United Kingdom students. The high level of failure of first and second year overseas students seemed to reflect, largely, poor performance in communication (mainly technical English).

Simmons, Kent, and Mishra (150), in a study of news media use in the slums of Ecuador and India, found that most of the readership in the Indian sample was concentrated in two Hindi-language newspapers, with an English-language newspaper ranking fifth. They also found that newspapers reached more slum dwellers than was anticipated, with radio reaching many more, especially women, and also being regarded as more believable.

Another group of reports might be considered to fall in the category of habits and traits in general (27; 35; 64; 111; 139; 172; 180).

In one of several studies involving newspapers, Carl (27) obtained results which indicated poor communication between editorial cartoonists in nineteen major U. S. newspapers and the populations surveyed. In a small town study, seventy per cent interviewed were in complete disagreement with the cartoonists' intended meanings; in a city study, sixty-two per cent were in disagreement.

Questionnaire responses obtained by Gottsdanker and Pidgeon (64) revealed fiction as the most popular kind of reading (40 per cent of authors mentioned) for a selected group of University of California (Santa Barbara) students with high aptitude scores, with social and political commentary next most frequently mentioned (20 per cent), and religion third (10 per cent). Of over three-hundred different books listed, only two authors, Camus and Hesse, were mentioned by more than 10 per cent. The students' major concern was viewed as "a personal quest for meaning, with existential thought predominating" and that "the heart of the list might even be interpreted as a vignette of the hippy orientation—anti-materialism, dependence on love as a modus operandi, sympathy for minority groups, suggestivism, enjoyment of fantasy, and emphasis on the immediacy of experience" (64:383). Also regarded as noteworthy were the books "*not* mentioned," such as works by Mao Tse-Tung, Allen Ginsberg, Saul Bellow, and Maharashi Mahesh Yogi. Over half the books mentioned were ones which had been ordered by book stores for courses; and departments standing out "most vigorously" by student choices of reading remembered as influential were history, English, sociology, religious studies, and education.

Analysis of data obtained by Yarington (180), from weekly records of reading of University of Ohio freshmen, indicated fourteen hours as the mean number of hours spent weekly in reading, a minimal relationship between amount read and academic ability, an increase in the number of pages read just prior to examinations, a higher percentage of time spent reading unrequired material than in reading other materials except social science types, and significant variation in amount read and time spent in reading from week to week throughout the year. Cockerill (35) obtained questionnaire responses from 59 students at Hillcroft, a small British college, at the end of an experimental teaching program. On a section relative to discipline and study, twenty-seven students expressed positive enjoyment of the reading section of the curriculum; but only thirteen thought the section was of value. Only three expressed positive enjoyment of a weekly essay section of the class; but twenty felt that this section was of value.

Merrill and Brown (111) found only nine foreign publications "fairly well known" by a sample of 100 University of Missouri students, with only *Pravda* and *The Times* (London) known by as many as 60 per cent. Journalism students were able to name the most foreign publications (forty-nine), followed by sociology students (twenty-eight). Students were found to be much more aware of Western Europe and Soviet Union publications than of those of other parts of the world. Weaver (172) obtained questionnaire data, relative to newspaper and news periodical reading habits, from 164 in-service teachers involved in course or other work with the University of Maryland, with teachers divided into low, middle, and high groups according to scores obtained on the *Time Current Events Test 1968* (intended for high school students). Weaver considered the current events test scores "low" for the low group and "not encouraging" for the middle group. Teachers "reported reading worthwhile newspapers," with over half the middle and high groups reportedly reading one of several news magazines, and with 30 minutes daily the median time spent reading news. Weaver further concluded that news aspects relevant to the great issues and problems of the time were rated as important by "too few teachers."

In another study involving teacher groups, Roeder (139) obtained telephone interview data about leisure reading habits of two-hundred classroom and special area teachers and a comparable sample of non-teaching females. Among his findings were that the median number of books read by teachers was greater than the number for non-teachers, younger teachers (in their twenties) read more books than did older teachers, amount of education was a major factor for number of books read among both groups, and the quality of magazines read differed greatly for the two groups. Although over 90 per cent of the teachers were readers, the investigator concluded that teachers were not active, as a group, in "wider reaches of literate pursuit" and that neither group of adult females was setting a desirable example for motivating children to become enthusiastic about reading and to pursue reading as a desired leisure time activity.

An additional number of studies reported have relevance with regard to mass media. Among findings obtained by Allen (7) in an investigation of media use patterns of Pittsburgh Negro ghetto residents were that Sunday papers were purchased approximately four times as much as were dailies; but since only a "small portion" (one section) was usually read, the amount of reading time for Sunday readers was not significantly greater than for daily or weekly readers. It was found further that approximately five-and-one-half hours a day were spent in radio listening, that approximately one-third of the respondents indicated "sales" as their favorite newspaper section, and that newspapers were used "scarcely or not at all" (7:526) for learning about news events of importance. Responses in Jacobson's 1966 sample survey of Wisconsin adults (83) showed that the adults regarded television as the most believable news source (46 per cent) followed by newspapers (31 per cent) and radio (11 per cent). Those favoring newspapers judged them to be more authentic than radio, but significantly less objective than radio or television, which "could be interpreted to mean that some respondents want bias in a medium which carries news to them, presumably especially if the bias coincides with theirs" (83:27). Simmons' study of news media use in India and Ecuador (150), was referred to in another section. A report in *Time* (85) revealed results of a survey undertaken for *Time* by Louis Harris, with a "representative sample of 1,600." Among Harris' reported findings were that nearly two-thirds of adults surveyed felt better news-informed today than they did five years ago. Nearly one-half preferred television, and one-third the newspaper, if given a choice of only one source of news; but, conversely, 44 per cent said that they would be upset if they lost their newspapers for a month, while only one-third would be if they lost their favorite television newscast for that time. *Time* was found to be familiar to over half the general public and 77 per cent of college students, with about the same degree of familiarity found for *Newsweek*. "High trust" ratings of 46 per cent, 42 per cent, and 40 per cent, respectively, were given by readers interviewed to *U. S. News and World Report*, *Time*, and *Newsweek*.

Results obtained by Sommer (153) in a survey of student study accommodations in five universities, five colleges, and one junior college, pointed to the need "for understanding the student's room as a micro-environment" (153:274). Among other findings were that the presence or absence of a room-mate was of less effect upon studying than was what the roommate was doing; that a student was more likely to be studying if a roommate was studying; that while most studying was done at desks a considerable amount was also done on beds; that easy chairs and sofas were heavily used for studying in apartments; and that students tended to see their rooms as superior to libraries with regard to privacy, comfort, and relaxation and snacking possibilities. Freedman (59) found young adults in an Upward Bound Program indicated preferences for studying together, in the presence of others.

Several other reports concerned skills other than, but related to, reading. (1; 43; 69; 108; 147). Crambert (43) reported that scores obtained on 1,559 employed workers, tested by agencies affiliated with the U. S. Employment Service to establish norms for dictation tests, showed dictation test scores strongly skewed but spelling test scores "more nearly normally distributed." A test of handwriting speed administered to 250 University of Missouri undergraduates showed females performing significantly faster (69). McLaughlin (108) presented criticisms and arguments against criticisms (chiefly comments made earlier by Spache, in a January, 1962 issue of the *Reading*

Teacher) on reading at "impossible" speeds. He then presented a detailed analysis of reading behavior of one fast reader and the mastery of content as to what had been read. Additional normative data on reading distance, collected during an experiment on optical character recognition forms by thirty-seven males and forty-one female high-school graduates, have also been presented (147). It was found that girls tended to hold papers slightly (but not practically significantly) closer than boys and that wearing of glasses was not associated with holding the paper closer. Abbatiello (1) referred to "at least three different experiments" (1:59) from which it was learned that subjects can listen to oral reading at 300 words per minute without a loss of comprehension; but details were not given.

Among findings obtained by Phillips (128), in a comparative study of oral and writing vocabulary lists for adults (Jones and Wepman's *A Spoken Word Count* and Horn's *A Basic Writing Vocabulary*) were a great variation between written and spoken communication, "almost absolute randomness in frequency rank" indicated by nonsignificant correlations between frequencies of use of words used in speaking and in writing, and use of words of greater syllable length in written than in spoken English. Howes (78) analyzed, in terms of frequency, 250,000 words obtained through recorded interviews with forty-one university students and hospital patients. Of the total of 9,699 different words, 4,097 (almost half) occurred only once. Fewer than fifty words occured over 1,000 times.

INFLUENCE OF READING, STUDY, AND RELATED HABITS AND SKILLS

A number of reported studies yielded indications of the influence of reading and related habits and skills. (A considerable number of the reports referred to in the preceding section and in the following section also have considerable pertinence for this area). Test scores in reading and in other areas were involved, mainly or in part, in a considerable number of reported studies, including several prediction studies (53; 66; 99; 121; 134). Significant correlations or indications of significant influence were indicated for reading (63; 102; 107; 110; 176; 177), English (99, 102), and study habits (49; 102) scores in a number of reported studies; but non-significant or low relationships were indicated for reading (6; 66; 99; 177), English (36; 53), and study habits (121) in others. Marshall (102) found selected single cognitive variables, (including English and reading test scores) to be better predictors of academic achievement of Abilene Christian College students that were non-cognitive variables (such as study habits and personality traits), with a combination of both types of variables increasing prediction effectiveness. (E.g., Brown-Holtzman SSHA scores were effective predictors when included with cognitive factors.) Among factors found by McGee (107) to be significantly related to success on the *Junior English Examination* given to University of Arkansas students were *Cooperative English Test* scores. The mean scores, on seventeen variables, of a group of Ball State University students who had completed the elementary education program were compared, by Medler (110), with a group who had become academically disqualified while pursuing the program and with a group who had changed from elementary education to another major. The graduated elementary education group was found to be significantly higher on all subtests of the *Cooperative School and College Ability Test, New Purdue Placement Test in English,* and *Sequential Tests of Educational Progress,* indicating superiority or greater ability for the elementary education group in, among other phases, areas of reading comprehension and vocabulary interpretation. Among selected variables which were found by Williams (176) to differentiate dropouts from Washington colleges and universities from graduates and returnees were lower reading aptitudes. Reading scores were among the independent variables in Walter's study (170) which predicted first offender versus rescidivist status of incarcerated Alabama criminals; but this group of variables did not predict incidence of disciplinary action or students versus non-student status.

Lunneborg and Lunneborg (99) found that predictors having the highest degree of correlation with success of students in six Washington state community colleges were high school grade-point averages, with English averages tending to be highest. Highest correlations among test scores were with English usage and quantitative skills; relatively low correlations were obtained with reading speed and comprehension scores. Several others have also reported finding low or non-significant relationships of reading and related test scores to academic success. *Nelson-Denny Reading Test* scores of a group of Texas Southern University freshmen were among several variables found by Green (66) to be non-significant in predicting semester quality-point averages. Wilson (177) found *Cooperative English Test* reading scores to be among the twenty-five of twenty-seven variables studied which were not significantly related to academic achievement of a group of Tuskegee School of Education freshmen. Among several variables studied by Allen (6), scores obtained with the *California Achievement Test* and the *Nelson Reading Test* by adult Indian subjects participating in University of Montana training programs apparently were not related to success or failure in the programs. The most significant variable found by Elton (53) to differentiate educational outcomes of Ashland (Kentucky) Community College students was other than ACT English score, one of four ability measures involved; and addition of this and other variables did not add significantly to differentiation.

In a study involving a group of freshmen women, Desiderato and Koskinen (49) found a definite relationship between good study habits

(Brown-Holtzman SSHA) and higher grade-point averages. They also found that women with "high facilitative-low debilitative" anxiety have better grades, as well as better study habits, then do women of "high debilitative-low facilitative" anxiety; but level of anxiety had no effect on grade-point averages. O'Donnell (121) found no relationship between Brown Holtzman SSHA scores of California State Polytechnical College freshmen students on probation and those in good standing.

The diagnostic value of reading and study scores for placement in, or in connection with, remedial programs has been noted by some (66; 102), whether such scores were found to be high in predictive value or not. Influence of spelling and/or writing scores and skills has also been noted (110; 176); but college dropouts in Williams' study (176) were found to have higher spelling scores than were graduates with marginal academic potential.

Indications other than test scores of the influence of reading study skills were indicated in other studies. (10; 16; 49; 60; 61; 63; 116; 134; 179) Recommendations for added emphasis on, or conclusions that a major need existed for, remedial services were made on the bases of findings in Gardner's study (60) of freshmen dropouts at Northwest Mississippi Junior College and Wright's study (179) of scope and effectiveness of student personnel services in eleven New England junior colleges for women (179). In a study of attrition factors affecting talented engineering students at Michigan State University, Asplin (10) found that "more satisfied" students reported spending more time in studying than did "less satisfied" students, among other differences. Weak study habits developed in high school were among various pre-college characteristics found by Bogue (16) to be associated with non-persistence of Memphis State University freshmen. Among findings in Gilmore's study (61) of factors in the high rate of freshmen attrition at Sam Houston State College were that a majority of males who withdrew indicated that they had not learned how to study in high school and that the retention group studied more than did the withdrawals. (However, the freshmen thought they had good or average reading ability.) Williams (176), referred to earlier, also found reading (and spelling) aptitudes influencing attrition.

Reading was one of the high school basic education areas with which graduates of Kanehameha (Hawaii) High School who had attended college were found by Moulton (116) to be most pleased. Among the relatively large number of variables studied which failed to discriminate effectively among successful and unsuccessful Louisiana State University graduate students in psychology were number of hours and grade-point averages in English (134).

The relationship of reading and related test scores to performance on other tests has been noted in other sections (e.g., 36, 107). Political party was found to be the "overwhelming factor" in a 1964 Chicago and suburban county election; but newspaper endorsements explained the major source of variance which distinguished among Democrats and Republicans. Schmidt (145) found that eye movement pattern, as recorded by an electro-oculograph of a group of Purdue University freshmen taking a developmental reading course were altered significantly differently from a group taking a composition-literature course. (Schmidt pointed out that whether eye movements were a cause or a result of efficient reading was not relevant to the study.)

FACTORS INFLUENCING READING AND OTHER HABITS AND SKILLS

A considerable number of reports found pertinent for purposes of this review was concerned with factors influencing reading and other habits and skills. Several of these involved speech and listening factors. (72; 81; 92; 93; 94; 123; 127; 158). Orr, Friedman, and Grace (123) obtained indications that twelve male college students preferred tape-recorded historical passages being played one-and-one-half times normal speed rate to playback of passages at self-controlled rates; no significant differences were found either in comprehension at the different rates or in speeds chosen. Sticht (158) presented selections in uncompressed, compressed, and compressed-expanded versions (original compressed version expanded to normal rate but with retention of original and added expansion distortions). Significant reductions in comprehension were produced by the expansion process; but comprehension for two compressed versions was not significantly different. In a second experiment, in which compression rate was varied, comprehension was significantly poorer for versions of selections in which inflectional cues of emphasis or meaning were present than in selections without such cues. Sticht found further that performance was also significantly better for the uncompressed, 75-word-per-minute condition than for the other combinations of compression and rate; but no differences were found among the other versions.

King (92) found the recall accuracy of connected meaningful material, read under auditory feedback conditions by 120 introductory psychology course students, was not affected by whether or not subjects were told they would be asked to recall. In another study, King (93) found that when groups of Albion College introductory psychology students read short stories aloud under auditory feedback conditions, reading rate and recall accuracy scores were significantly affected. In still another study involving auditory feedback, King and Cotton (94) found that subjecting groups who read a story aloud once, twice, or three times to delayed auditory feedback during the entire reading resulted in a partial inhibition of memory; but increased learning trials did not lead to increased memory losses.

In a study of effects of various factors upon word legibility of materials read by 72 college students, Erdmann and Neal (54) found word familiarity to have noticeable influence on unit word legibility but word length to have little effect. In familiar material, word legibility tended to be the same or higher than letter legibility, but less than in unfamiliar material. Poulton (130) found no differences in comprehension of English adult good readers (paid psychological research panelists) when they read 450-word passages in Siemens teleprinter capitals with triple spacing and in IBM elite lower and upper case letters with single spacing. However, a group of poor readers found elite letters easier to comprehend and showed positive transfer effects when elite type was read first, negative when Siemens was read first. In a study reported by Kastl and Child (87), groups of Yale University and City College of New York introductory psychology students indicated that groups of letters exposed on slides in curved, light, and ornate type face suggested spritely, sparkly, and dreamy moods while moods of sad, dignified, and dramatic were assigned to angular and bold. Serif type face appeared to be associated with judgments of both types of emotional meaning.

Hardyck and Petrinovitch (72) described apparati for detecting and treating subvocal speech while reading and reported that studies have indicated that elimination of subvocal speech occurs fairly rapidly with above-average and average students, and more rapidy for college than for high school students; but they had not found any of the speculated "sudden sharp jump in reading speed" accompanying the elimination. Isaacson (81), in a study with 120 New York University freshmen who had heard a normal voice session, and one of three other voice versions, of the *Brown-Carlsen Listening Comprehension Test*, found recall best with the normal voice tape, with denasal voice quality not having, but nasal and weak voice quality having, severe inhibition on recall. Peterson (127), after a number of experiments, concluded that evidence "leaves little doubt" that two verbal activities can be carried on concurrently by subjects. He found that instruction to rehearse another verbal activity, such as reading or adding of digits, improved comprehension even when subjects were reading aloud at the same time.

On the basis of data obtained with various laterality, vision, personality, and intelligence tests, on 138 male college students who were disabled readers, Cashman (31) concluded that reading disability and brain damage impairment were related but that none of the variables studied inhibited significant improvement of reading comprehension in a reading improvement program. Nadien, Schaeffer, and Schmeidler (117) found fast reading of a 639-word *Nelson-Denny Reading Test* selection related to good comprehension and strong eye dominance for introductory psychology class students in a good mood, but not for other subjects. Field dependence (as determined with the *Hidden Figures Test)* was found to be correlated with weak eye dominance for subjects in a negative mood.

Several other studies had relevance for Rothkopf's "mathemagenic" hypothesis. (13; 57; 118; 142) In a study of a report by Berliner (13), three groups of freshman college students were exposed to test-like events during a 45-minute lecture on Chinese history, with one group being given questions every two-and-one-half minutes, the second group two questions every five minutes, and a third group six questions every fifteen minutes. One control group took notes; another control group paid attention only during the lecture. No significant differences were found on criterion test scores between the three experimental groups considered as a set and the two control groups considered together; obtained differences favored experimental groups. Only paying attention during a lecture was shown to be an ineffective learning technique; and note taking seemed no better relative to one criterion test. In a study reported by Frase (57), a group of college females who read a passage to find names of verbal concepts for which they were given attributes, but who were not instructed to learn the materials, retained fewer attributes and names than did a group which had read material in which the same sentences were organized by concept name. In an investigation of arousal effects of adjunct questions over long-term, as well as short-term, recall of prose selections by 28 students in a Bucknell University introductory psychology course, results obtained by Natkin and Stabler (118) indicated that adjunct questions (to be answered after each page) improved performance; that if immediate recall is to receive priority, questions should be liberally supplied; but if long-term or delayed retention of recall is stressed most, questions should be used sparingly. Rothkopf and Coke (142) found that learning, as measured by a cloze procedure, of college student volunteer subjects about sentence fragments, which had been imbedded in sentences in a basic text of approximately 1,300 words, was related to how noticeable the fragments were or how frequently the fragments were detected in the augmented text after one to three readings of the basic text. Learning decreased with number of readings for fragments of low, but increased for fragments of high, noticeability. The investigators interpreted results to indicate that "inspection behaviors" play an important role in what is learned in connected discourse and that this behavior is modified by repeated exposure, which then may have interfering effects on learning of newly added material.

A number of other studies also had pertinence relative to influences on recall and comprehension of words and connected discourse. (15; 37; 50; 95; 113; 122; 140; 143; 148; 151; 163; 173) King and Russell (95) found that the recall of a short selection read by groups of

American University undergraduate introductory psychology course students was greater, in general, when subjects read for main ideas and when they read with word-for-word instructions. When subjects were instructed to learn in meaningful units, they tended to recall more words or word parts than ideas or sentences; and when instructed to learn word for word they recalled more ideas and fewer words and letters. Mills (113) found a positive relationship between prior familiarity with sentences in connected discourse and recall of short prose passages by twenty paid, volunteer University of Capetown science students. Okatcha (122) found that number of presentations was not a significant facilitating factor in learning of prose material by 120 subjects; but complex grammatical constructions in material affected recall and comprehension adversely. Slow, one-trial modes of presentation apparently had greater facilitating effect on recall and comprehension of grammatically complex material than did either massed or distributed distribution modes. When comprehension and attitude changes of a group of Memphis State University speech students who listened to a tape message on segregation while distracting stimuli were introduced (slides irrelevant to the message) were compared with those of a group who had heard the tape message without the distracting feature, Shamo and Meador (148) found significant reductions in the amount of recall of information and significant increase in the amount of attitude change in distracted groups. In another study (50), when the reading of nine highly-anxious college females *(Taylor Manifest Anxiety Scale)* was compared with that of nine females of low anxiety, comprehension of sections read (and recorded with an eye-movement camera) was comparable for the two groups; but the high anxiety group made more eye movements.

Bobrow and Bower (15) found that noun pairs were better recalled when subjects generated their own linking sentences for the pairs than when they were merely parroted and read in equivalent linking sentences; and they were also better recalled when subjects were given instructional sets for working with sentences. Cofer (37) found that item recall of selected nouns by undergraduate psychology class students was poorer when nouns were presented in sentence context than when presented in lists; and category clustering of nouns was also usually poorer. He interpreted this as suggesting a temporary disrupting effect of context on category membership or internoun associations. Rosenberg (140) found that associatively related nouns imbedded in connected discourse were recalled (cloze procedure) by groups of paid volunteers from introductory psychology courses better than were associatively unrelated ones, even when construction opportunities during retrieval (selecting words from a list of nouns) were considerably reduced.

Samuels (143) reported that twenty introductory psychology course students, when exposed to five conditions of tachistoscopic presentation of paired words, had higher speed recognition scores when the second word was associated with the first than when non-associated pairs were presented and also obtained higher scores than did a control group who had tachistoscopic presentation of target words only. Smith and Landy (151) found further support for the hypothesis and earlier finding of better visual discrimination, by skilled readers, and success in pronouncing of pseudo-words which illustrated spelling-to-sound correlation than of words with no, or only partial, spelling-to-sound correlation. In a study carried on with University of Wisconsin undergraduate students in speech courses and involving application of cloze procedures, Tannenbaum, Williams, and Clark (163) found that when form class (such as nouns or prepositions) of words was indicated, a rise occurred in replacement of words of a given form class; verbatim replacement was enhanced in the case of function-type words (such as prepositions and articles), but not in the case of semantic-type words, such as nouns, adjectives and verbs. In a study which involved production of original stories (in response to stimulus cards) by some groups of college students, reading stories by other groups, and cloze testing for both producers and readers of the produced stories, Weaver and Bickley (173) found that predictability of missing elements in stories was increased, but not perfectly, when the subject involved was a source as well as a destination of the passage. Interpretations were suggested relative to what happens to meaning when two individuals, an "Encoder" and a "Decoder," respond to the same language signals in different manners.

Still another group of reports had relevance for influences on opinions and attitudes. (22; 29; 75; 97; 105; 106; 126; 141; 148; 161) After presenting cartoons and editorials to over 200 Indiana University students in twenty-three different conditions, Brinkman (22) concluded that opinion changes (both conversion and inversion) are effected with cartoons and editorials, with use of the same main argument in cartoon and editorial being more effective than use of alternative arguments. When McCombs and Smith (105) compared analyses of graduate students' descriptions of six slides which had been shown with analyses of sixteen Mardi Gras news and feature stories written by reporters, they found the same pattern of attributes emerging, with color and shape appearing frequently regardless of the communication task, and moderate or infrequent mention being made of individuals' observed psychological states, social characteristics, habits, and mannerisms. Carter (29), in a study of changes in consumer magazine advertisements for the years 1950-1966, found more multiple-page ads but fewer illustrations per advertisement, with emphasis on making one big impression or a "Sunday Punch," and with findings interpreted as reflecting possible influences of television. Introductory psychology course students involved in a study by Hendrick (75) rated persons more favorably when pairs of traits described in information booklets complimented one another than when traits were strongly inconsistent. Results in a study of variations in message assertion intensity, done with undergraduates in a communication course, gave McEwen and Bradley (106) evidence that predictions of persuasion and change were more accurate when source and concept intensity were equivalent to message intensity level.

In a study with Alfred University undergraduate psychology course students, Pauling (126) found that commitments obtained by prior administration of pretest questionnaires had the effect of inhibiting the amount of opinion changes for sequentially presented special messages (one on racial integration and the other on nuclear warfare). In a fictitious perception experiment with female participants, Rosnow and Rosenthal (141) found non-volunteers who were presented with anti-fraternity information did not change opinions any more than did non-volunteer controls; but volunteers became significantly more anti-fraternity. Pro-fraternity materials did not change opinions of volunteers in a pro-fraternity direction, but did those of non-volunteers (with volunteers' opinions significantly less reliable than those of non-volunteers). Stone and Eswara (161) found that changes in attitudes made by University of Wisconsin students in an undergraduate radio and television course, after reading one of several versions of an attitude message concerning television in the courtroom, reflected interaction of likability (but not expertness) of source with self-interest in effecting persuasion. Stone (160) found neither source-inoculation nor message inoculation conditions (attack on the source of a message or on the information in the message itself) changing attitudes of source-oriented or message-oriented groups of University of Wisconsin introductory psychology course students. However, self-esteem was found to have interacted with immunization strategies, with source inoculation effective for low-esteem subjects and message inoculation more effective with high-esteem subjects. In a study of the relation of intellectual attitudes and activities of liberal arts college freshmen and their academic achievement, Brown (24) found a tendency for a greater number of intellectual books and magazines to be read by students who were oriented toward problem-solving, expressed interest in literature and art, were tolerant of new ideas, and preferred abstract thought. In a survey of Fresno California adults, Rees and Paisley (137), found a "clearly-profiled" audience for each of a number of channels of communications. Three of five media-use behaviors (readership of newspapers, all magazines, and news magazines) were found to be predicted best by life-style factors (such as education, income, and organizational memberships).

Chang and Lemert (32) found the immediacy and recency of television news and the relative anonymity of news reporters to be two of the important factors in the generally greater believability or credibility assigned to television by a random sample of 250 Illinois householders. Findings obtained by Clyde (34) in a readership survey of the mid-week issue of a Minneapolis newspaper were that unpleasant news attracted significantly more readership than did the other kind, except "interesting," and that judgment of the importance of news influenced readership very little. Factor analysis of source-rating data collected in Hong Kong and Brazil by Lemert (98) revealed the general factors of "safety," "qualification," and "dynamism," results similar to those of earlier studies in the United States and Canada. Findings obtained by Pierce (129) indicated that editorial stands taken by newspapers in four Latin American cities could serve as predictors of predominant public sentiment on topics concerning international politics; that identification with regular newspapers was relevant only in case of high prestige, not mass appeal, newspapers; and that neither literacy nor political stability seemed related to rate of agreement.

Bostrom (17) did not find any definite relationship between class size and development of critical thinking skills in beginning State University of Arizona students. Moe (114) found *Nelson-Denny Reading Test* scores of freshmen elementary education majors correlating positively with *Edwards Personal Preference Schedule* achievement-need scores. He concluded that the Preference Schedule scores "tend to be transparent regarding the traits of majors." Moore (115) found no significant differences between high and low value changers *(Allport-Vernon-Lindzey Study of Values)* with respect to various data, including those on study habits. Walter (170) reported finding a positive relationship between the "I" factor ("tough-minded-tender-minded" on the 16 PF Scale), but a negative relationship between the "O" factor ("placid-apprehensive"), and reading scores of 60 incarcerated Alabama criminals.

MISCELLANEOUS (TESTING, READABILITY, AND OTHER)

In a number of reports, the focus was on tests and/or testing (19; 20; 44; 56; 133; 165). Results of factor analyses of data, obtained with students in junior level educational psychology courses on three critical thinking, one logical reading, and one English tests, led Follman (56) to conclude that critical thinking was a composite of several specific factors rather than a general ability, that a logical thinking test represented "near specific variance disparate from the other measures" (56:159), and that there was considerable overlap of English test variance with critical thinking test variance. Rankin and Dale (133) applied residual gain techniques to reading improvement gains, as measured by the cloze procedure, of Texas Christian University students. They concluded that the cloze tests measure pre-test and post-test reading knowledge validly and reading gains highly sensitively and that cloze residual gains offer "a new dimension to the measurement of reading ability," "as a technique of measuring *individual differences* in reading skill, *not group differences*" (133:125). A residual gain method was also applied by Taschow (165) to Nelson-Denny scores of community college freshmen in a reading improvement program. He concluded that residual gain procedures, in comparison with crude gain procedures, tend to be more reliable measures of individual reading gains, that gain measures are not affected because of initial pre-test score differences, and that estimates of level of improvement relative to individual proficiency and progress are permitted. On the basis of reliability and validity coefficients of cloze scores (obtained with two types of cloze tests, constructed to measure reading comprehension of two groups of college students) with Cooperative reading test scores, Cranney (44) concluded that both long and short forms of the cloze tests were valid measures of reading comprehension and reliable measures for group, but not individual, comparison; but the two cloze tests were judged not comparable since they tested different abilities. Braun and LaFaro (20) found that groups of university students in introductory psychology classes and high school students participating in a pre-college science institute who were instructed to fake their answers on the *California Study Methods Inventory* (contrary to instructions in the questionnaire booklet) scored higher on all eight comparisons (significantly on six of eight) than did groups who had responded under regular instructions. However, the "verification" scores, obtained with the questionnaire and which supposedly would enable detecting faking, were found to be "useless for the purpose" (20:168).

Readability was involved in a number of other reports. (9; 52; 55; 96; 109; 112; 175) Miller and Coleman (112) analyzed thirty-six relatively short, 100-word, prose passages of a range of difficulty and complexity by trying three versions of cloze techniques (deleting every fifth word, deleting only one word, or having subjects guess each word in a passage in succession) on 479 college students. They concluded that "the sum of the three cloze scores for a passage is a rather reliable measure of its perplexity" (112:851). Aquino (9) presented data for the *Miller-Coleman Readability Scale* (MCRS), based on cloze scores obtained through use of word-for-word recall and subjective judgment techniques. He suggested that a precisely graded scale which might be useful for correlation studies, or for computing of readability formulas, was offered by the passages.

Klare and his co-workers (96) have described a computer program for application of the Flesch and other related readability formulas, purportedly affording greater accuracy and flexibility, written in a popular programming language, and designed to run on a popular computing system. McLaughlin (109) presented "SMOG Grading," a readability formula which was claimed to be "even quicker" and "more valid" (109:638) than the Fry and other readability formulas. Information and data intended to substantiate his claim were presented. The formula involved counting polysyllabic words in thirty sentences.

Dulin (52) found that four readability formulas (Flesch, Farr-Jenkins-Patterson revision of the Flesh, Gunning, and Fry), applied to the lead article in the five top-selling magazines in each of the three categories of women's, men's, and general interest or family magazines, ranked content on easy to difficult levels "about equally well." He obtained relatively high readability levels for contemporary popular magazines (in general, of approximately tenth-grade level and up). An analysis by Facos (55) of written communications issued by school districts of the United States showed that communications had a readability level of eleventh- to twelfth-grade (Dale-Chall formula); but little relationship was found between difficulty level of communications and educational level of school district population; and little differentiation was made relative to intended audiences (teachers, pupils, parents, and the like) for the communications. Wilhoit (175) found "Zipf's law" of vocabulary balance, the statistical regularity between word frequency in a given text and word ranking of most frequently-occurring word and least-appearing word, to be supported by a test involving an over-100,000-word sample from Associated Press news prose; but the larger sample, compared with the 44,000-word sample used by Zipf, revealed some erratic features, especially with regard to "standard slope of the prediction line."

Three follow-up studies of subjects who had received help in a remedial reading center in the earlier school years, were reported. (71; 77; 159) Hardy (71) reported a follow-up of four young adults with clinical and remedial reading help during elementary years, with each case being an illustration of one of four categories. Only one of the four types made relatively satisfactory reading and academic progress in later schooling. A follow-up study of selected good, average, and poor readers who were involved in a 1948 research project was done nineteen years later and reported by Howden (77). *Gates Reading Survey* pre-test data and personal interviews were involved. Good readers were found still to be good readers; average readers' scores overlapped the lower end of the good readers'; and the upper end of poor readers' overlapped adult scores. The poor readers for one group were found to score within the score range of average readers; one group remained poor, scoring approximately from middle fifth- to middle seventh-grade levels; and a third group, all with below average IQ's, was found to be "illiterate." Amount of reading was found to be related strongly to current reading skill. A "descriptive-analytical" research method was used in a follow-up study of students four to nine years after they had received remedial help in the University of Florida reading clinic. Of the 83 students contacted, 95 per cent reported they felt they were able to cope with their educative, vocational, and leisure reading needs; 58 per cent attended or had been graduated from college; 42 per cent attended or were attending high school.

Several reports involved analyses or evaluations of materials (11; 71; 68). Bailey (11) found the short story heroine in women's magazines *(McCall's, Ladies Home Journal,* and *Good Housekeeping)* to be of the same type in 1967 as in 1957, with one noted change being the type of problem the heroine was most likely to have (a psychological in 1967 rather than a romantic one, as in 1957). She concluded that women's magazines have taken "almost a reactionary stand against the career woman" (11:360). The study was prompted in part by Betty Friedman's *The Feminine Mystique.* Hankins (70) collected data through review of the literature, examination of content of twenty recent biology textbooks, and obtaining of questionnaire responses from 150 competent research biologists. A major conclusion drawn from the data obtained by Hankins was that problem-solving exercises, collateral readings, summaries, and audio-visual aids should be utilized to help students obtain objectives of the course. Trumbull (168) discussed the preparation of special texts for improving the reading of English of Afghanistanian college students. Questionnaire comments elicited from teachers indicated favorable reactions to the general utility of the text and the specific effectiveness of tests.

Two reports of a study of secondary teachers' attitudes toward teaching reading in the content areas have been reported by Otto (124) and by Smith and Otto (152). Responses obtained with a specially constructed attitude inventory indicated, in general, recognition by teachers of a need for continuation of reading instruction at the secondary level, a willingness by teachers to assume responsibility for teaching skills peculiar to the content areas, but a teacher-felt need for more training for doing this. In an experimental attempt to change teachers attitudes positively toward teaching reading in content areas, 20 junior- and senior-high teachers participated in a personal reading improvement course instead of a conventional in-service methods course (152). While teachers made "substantial" gains in reading test scores, no major changes in attitude were revealed by inventory responses.

Tuttle (169) reported, on the basis of price indexes for 1969 periodicals, that science and technology journals continue to be the most expensive of the U. S. periodicals and continue to increase in price faster than those in other fields. The 1969 prices for four science content areas were double what counterparts were during three index-base years, 1957-1959.

Of interest to those working in the area of college and adult reading and of considerable relevance to much of the research related to this area is a study and report by Schultz (146) on the human subject in psychological research. Schultz has pointed out that when psychological journals are read the impression given is that seemingly the only people of interest to psychologists are college students; and he further points out the problem in generalizing, from study results, made by a restricted sample of college students. Some of Schultz's generalizations seem particularly pertinent to and appropriate for a number of the studies pertinent to the area of college and other adult reading:

> And so we have the human subject who actually enters the laboratory and provides the data for a study of human behavior. He is primarily a male college student and is often enrolled in a psychology class. At least some of the time he will be a subject because he happened to be in class on the day volunteers were recruited or because his own personal characteristics and/or some aspect of the recruiting situation led him to volunteer. If a course requirement dictates that he serve as a subject, and if he has a choice among experiments, his own personal characteristics may lead him to choose one kind of experiment as opposed to another.
>
> Are our subjects chosen at random? Are they representative of the general population, of the population of college students, of the population of college sophomores, or even of the sophomores of their own college? The answers to all these questions for much of the reported research would seem to be a taunting and haunting No. (146:219)

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Lapros: A Functional Description of Language Program Synthesizer Computer Programs

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LAPROS is designed as a series of computer programs which can be used to assist in the production of language teaching programs. The system is completely flexible in that parts of LAPROS can be used to produce language teaching programs of any type.

The purpose of LAPROS is to provide a flexible system which will (1) reduce the clerical work involved in program production; (2) increase the accuracy of the adherence of the program to any theoretical model; (3) sharply reduce the required time for program production.

Using LAPROS, true experimental controls in either methodological or stimulus variable experiments become possible, since the time required to prepare two programs which differ to a controlled degree in only a single variable is not significantly greater than the time to produce a single program.

LAPROS makes it possible to tailor a language or a reading program to a specific audience, such as adult illiterate migrant farmers in the South, or Mexican-American adult illiterates in the Southwest, or urban deprived children in Northeastern cities. It is also possible to produce programs specifically designed for bright or dull children, covering the same materials or topics.

LAPROS can be used to produce programs in any language teaching medium such as reading, spelling, handwriting; or in any combination of media such as reading-typewriting, or spelling usage and typewriting. Further, it can be converted to any language written in English script, or any combination of two languages, such as Spanish and English.

Since LAPROS reduces the amount of clerical time, editing and supervision, it is possible to produce several programs at the same time with a minimal staff.

Following is a description of the individual programs and their relation to LAPROS.

THE PHOSORT PROGRAM

The purpose of the PHOSORT program is to put phonemes in order for the development of linguistic language programs. For either progressive-part or linear-discriminability-phonetic programs, discriminability of successive phonemes is of great significance. The PHOSORT program is designed to eliminate as much of this discrimination problem as possible. In progressive-part programs the combination of phonemes into words must be as productive as possible so varied practice materials can be given. Therefore the order of presentation of the phonemes should also be related to their usefulness and frequency of occurrence in the English language.

The PHOSORT program is designed for the IBM 7040 or the IBM 360, and has the following characteristics: an initial letter is presented to the computer; given this initial letter, the computer will produce a list of up to 44 phonemes such that each successive phoneme is, maximally different from the preceding one in sound; and in shape, as regards capital letters, manuscript small letters, or cursive small letters. The phoneme is maximally useful in that its frequency occurrence is highest of the possible phonemes available.

The PHOSORT program can be restricted to small groups of phonemes of any size, and can handle several groups of phonemes successively. For instance, in constructing an order of presentation of phonemes for a elementary typewriting program, the PHOSORT program can be restricted in the first phase to phonemes of those letters which are struck with the two index fingers. The second group of phonemes could be those struck by the middle fingers; the third group, by the third fingers, and so on.

PHOSORT also can be restricted in terms of simple versus complex phonetic elements. Thus the first phase of the order will contain only the simple phonetic elements, each composed of single letters and short vowel sounds; and the second phase can be composed of digraphs such as *th, sh,* or long vowels in their regular rule situation.

The learning of new words, particularly when no meaning is involved, is also related to the emotional tone generated by the sound of the word. Thus a sonic affect scale is built into the program which selects phonemes which sound the best.

Since the PHOSORT program operates on the basis of a multiple regression equation, one may vary any of the variables involved, in relation to their strength or contribution to the phonemic order. For the PHOSORT program, several scales are stored in the computer. These are: 1) the scale of phonic discriminability; 2) three scales of shape discriminability of orthographic signals; 3) a scale of frequency of phonetic elements; and 4) a sonic affect scale.

The present set of variables appears to be those most significant in ordering letters for appropriate teaching sequences. However, PHOSORT is flexible in that other scales may be added. The PHOSORT program has the capability of producing rapidly the most teachable order of phonemic elements under any number of specified pre-conditions. The output for the PHOSORT program is fed directly into the WORDOT program to produce an order of teaching words which is related lesson by lesson to the addition of a single phonetic element.

THE WORDOT PROGRAM

The purpose of the WORDOT program is to group words into lessons according to the phonetic elements, and then to order the words within the lessons according to learning difficulty.

WORDOT reads an order of phonetic elements derived from PHOSORT, then searches a tape library for words which contain the appropriate phonetic elements. The tape library also contains empirical data for each word. A multiple regression equation is applied to the data, and the words in each lesson are ordered and printed. The printout from WORDOT consist of the following:

1) The word for the lesson in order of learning difficulty and by syntax. The order of learning difficulty is variable depending upon multiple regression equation used, which in turn depends upon purpose for which the language program is written.
2) A cumulative corpus of words, up to and including each lesson, is written.
3) Optional is the scoring data for each word. The programs may be in English, or foreign languages in English script, or both together.

The WORDOT program will employ any number of variables for ordering words within lessons, and up to 44 phonetic elements to produce lessons. At present the variables available for all words on the tape library are as follows:

1) Word length, which is read by the computer.
2) Sound discriminability per letter, which is the sum of the sound discriminability between successive letters, divided by the number of letters (or the number of phonemes in the case of silent letters or diphthongs).
3) The shape discriminability per letter, divided by the number of letters in the word.
4) The $\log_2$ of the frequency of occurrence of the word. The frequency of occurrence is taken from the Rinsland List, *A Basic Vocabulary of Elementary School Children,* and converted to a $\log_2$ scale.
5) The multiordinality, or number of dictionary meanings. In this case, *Webster's New World Dictionary* has been used, and the total number of meanings for all forms of the word is the multiordinality score.
6) The concreteness of the referent, which is a count of the number of senses which are normally applied to the referent for the word. In addition to the five senses of sight, smell, taste, touch and hearing, additional scoring is given for emotional

reaction, kinesthesis, or movement in relation to the referent, and the existence of the referent over time—that is to say, its stability as a stimulus.

7) The emotional tone of the word, which is the judged positiveness or negativeness of the word as determined by between forty and eighty college students, and converted into stanines.
8) Emotional intensity, which is developed in the same manner as above but relates primarily to the judged strength or weakness of the word, converted to stanine scores.
9) The most common syntax for each word, recorded with the word, and used as a signal for the syntax grouping.

The tape library at the present time contains nearly 5,600 words from the following sources:

1) *The Phonetically Consistent Graded Word List,* by Bloomer, which contains all of the simple phonetically-consistent words in the Rinsland word list;
2) *The Maximum Auditory Perception Word List,* by Haspiel and Bloomer, which contains all of the two- and three-phoneme words in the English language;
3) *The Dale-Chall Word List* of 796 words;
4) *The Thorndike Teacher's Word List*—the phonetically consistent or regular words in the first two thousand words.

More words, or words for specific purposes, may be added to the library with relative ease.

The WORDOT program affords a flexible method of ordering word materials in relation to phonemic structure and ordering the materials within each lesson according to any set of criteria of difficulty, to produce the basic raw material from which language programs can be built.

THE WORDISC PROGRAM

Research has shown that where similar stimuli are presented which require very differing responses, difficulty is at a maximum. The purpose of the WORDISC program is to discover where difficulties may arise in the output from the WORDOT program so that appropriate discrimination exercises may be built to ensure that the student will overcome these difficulties. In essence, the WORDISC program selects the difficulties within lessons which may cause confusion either in themselves, or with other previously learned words.

The input to WORDISC is the previously used phonemes, and words selected for the present lesson. WORDISC then searches the library for previously used words in the following groups:

1) Words in which there is the addition of a single vowel, such as *e,* at the end of the word (example: cap - cape).
2) Words in which there is the substitution of a single vowel (c*a*p - c*u*p; and c*a*p - c*o*p).

3) Words in which there is the substitution of a specific consonant with a similar consonant (*p*in - *b*in; *p*in - *d*in); and words in which two specified consonants occur, such as the *b* and *d* in bed, or the *m* and *n* in man or men.

Word discriminability may use either a sound discriminability or a shape discriminability table, depending upon the desires and purposes of the author.

THE FREW PROGRAM

The purpose of FREW is to determine the frequency of occurrence in any corpus of words, which in turn will allow a program writer to determine the most insignificant words and concepts involved in any material. The output from FREW is a list of words involved in each corpus, plus the frequency of occurrence of each word within the corpus. Thus, for instance, if we were to combine a reading program with a carpentry program, several appropriate books on carpentry make up the corpus presented. These would be fed to the computer, and the FREW program would give a list of the words and the frequency. This material would in turn make up a part of the tape library for the particular program, and when other variables were added, could be inserted directly into the WORDOT program. FREW may also give transformations of the frequency of occurrence, such as transfer of straight frequency of occurrence to $\log_2$, which is more highly related to the difficulty of learning words.

PROOFREADER PROGRAM

The purpose of the PROOFREADER program is essentially to determine which lesson the reading material will best fit. The input for the PROOFREADER program is the order of phonemes generated by the PHOSORT program, plus a corpus of material which is intended to be read by the student. The output for PROOFREADER includes printout for each word and the lesson in which that word will occur. PROOFREADER also gives the frequency of occurrence of letters of the alphabet and frequency of occurrence of phonemes in the corpus. In addition, PROOFREADER gives the mean and standard deviation of the sentence length, the word length, and the length of the material itself. This allows the user to check through every story to determine which words to present as sight words, or which words to change to modify a story so the learner will have mastered all the necessary phonics to read it.

READABILITY

The READABILITY program uses the computer to determine the reading difficulty of passages or books. One of the problems which has limited the use of hand-computed readability formulae has been the inordinate amount of time required and the inaccuracy of hand tabulation. The READABILITY program is based upon a multiple regression equation determined from the McCall-Crabbs test lessons upon the following variables:

1) mean sentence length
2) mean word length
3) number of prepositions
4) length of article or story

This last feature is important in relatively short material where the total material is included in the readability count. This variable, however, is optional when selecting passages from books, passages of approximately a hundred words in length from one sentence beginning to the sentence ending of a second. While the READABILITY program does not make as fine discriminations as some of the hand counting, it compensates in some measure for using less sensitive measures by the accuracy with which the counting is done.

FORMAT PROGRAM

The purpose of the FORMAT program is to produce exercises in a form useful for students. Use of the FORMAT program requires about fifteen percent of the time of handwriting these materials. Response tendencies of the writer often affect handwritten material, and these are avoided by use of the FORMAT program. FORMAT will produce sixty characters to a line and thirty lines to a page, maximum, although any small amount may be specified. Spacing can be specified for each line, or can occur randomly with specific maximum length. Runs or spacing may occur at specified intervals. When words are used, spacing may occur at the end of a word or in every Nth letter.

The input for the FORMAT program can be letters, words, phrases, or sentences. The output will be either in lines or in columns and the order of the output material can be either random, serial (with assigned serial numbers), alphabetical, in order of input, of difficulty, or by size. The FORMAT program allows the writer to set up a format for a particular kind of exercise, to take the output from either WORDOT or WORDISC and produce material which the children can use for effective learning.

QUORM

QUORM is a program to order the manner in which questions are asked, to provide a wide variety of question situations. The QUORM program relates to FORMAT in that the instructions for the various FORMAT outputs may be written on QUORM. There are a number of variables which relate to the difficulty of the questions regardless of the material which is used. These variables are involved in the QUORM program.

Variable 1 is the manner in which the child who responds is selected —i.e., either volunteers, or is chosen in order.

Variable 2 relates to whether pictures are used, or how they are used.

Variable 3 is the manner in which the child answers, that is, either aloud, or by pointing to something, or by writing.

Variable 4 has to do with the use or non-use of movement on the part of the child.

Variable 5 is the size of the answer—whether it is a single word, letter, or phrase, etc.

Variable 6 is the relationship of the stimulus to the response—that is, does the child repeat the stimulus, or does he make some interpretation of the stimulus and use another modality to respond.

Variable 7 is the situation in which the child answers the question—will he answer it alone to himself, in front of the class, in front of the teacher alone, with time or score as a variable, or in competition with others.

Variable 8 is the level of reinforcement the child is given, from tangible reinforcements such as prizes and candy, through to verbal reinforcements, and finally no knowledge of results at all.

Each of these variables is scored, and the sum of the scores for the variable gives the relative difficulty of the questioning technique. QUORM can be used therefore to control question difficulty and to increase motivation where numbers of repetitions of the same materials are used.

SENTENCE WRITER

SENTENCE WRITER is a program which, when given a specific syntactic sequence, will produce all permutations and combinations for this syntatic sequence. Very simple or very complex sentences can be produced, but each will have the same syntactic order. The problem with SENTENCE WRITER is that the amount of production is excessive to the point where (at the present time) until some method for limitation is devised, it is less of a problem to write sentences by hand than to use the SENTENCE WRITER program.

SUMMARY

LAPROS is a group of computer programs designed to facilitate the production of language teaching systems by ordering phonemes on the basis of sound and shape discriminability and frequency of occurrence. Words are selected in relation to their phonemic content and their difficulty. Especially difficult words or pairs are similarly selected for special attention. Word frequency can be obtained from any corpus of material, as well as a phoneme or a letter count and readability. Word materials are produced in format for reproduction and instructions for teachers produced.

LAPROS can be operated in two languages at one time to reduce the time and energy to be devoted to language teaching program production. It can also be used to produce matched programs differing by any one of a number of variables for experimental purposes.

The LAPROS computer programs are at present independent. However it is possible to combine several of the programs to increase efficiency. It would be possible to use LAPROS to design a specific program for a specific child in computer-assisted instruction by having the computer respond to the child's responses to generate the successive sets of stimuli. Thus a child would be taught by a unique program produced by LAPROS and based upon the responses of the child.

Effects on Reading Tests of Deletions of Selected Grammatical Categories

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PROBLEM

When we ask what reading comprehension tests measure, the answer seems simple and uncomplicated. The person taking the test is to read the paragraph and then answer the multiple-choice questions which follow. Underlying this task is the assumption that reading the paragraph is a prerequisite for answering the test items correctly. English and English (6, p. 442) indicated the need of prior perusal of a graphic display for reading to have occurred by their definition of reading as "the perception of written, printed, or engraved symbols constituting a communication. . . ." Thus it has been generally accepted that the source of information measured by reading comprehension tests is the accompanying paragraph. However, it has been found by Weaver and Bickley (11) that traditional reading comprehension tests function as tests of past learning or reasoning as well as tests of comprehension. It was this type of finding which prompted Carroll (4, p. 8) to state that "we need detailed investigations not only of the process itself as it occurs in mature, educated language users, but also of the development of the process through various stages of educational progress from the nursery school up."

Objective

The objective of this study was to examine the effects of the removal of certain grammatical categories on the reading comprehension of third, fourth, and fifth grade students.

RELATED RESEARCH

Blackout Technique

The blackout technique was developed by Holland and Kemp (8) through an effort to create a measure of programming in teaching machine material. Weaver and Bickley (11) attempted to use this technique to analyze comprehension tests and discovered that many of the answers to the reading test items were not dependent on specific locations or specific words in the reading passage. This resulted in an alteration of the technique which took the form of deleting certain grammatical categories in the reading passage. Instead of blacking out the deleted elements they indicated the locations by means of standard size blanks. This technique provided a blackout device which eliminated word-size cues and was utilized in this study.

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Reading Blackout

Weaver and Bickley (11) found that college sophomore students who had no reading passage to aid them in answering the multiple-choice items of a reading comprehension test succeeded in correctly answering 67 per cent as many items as Ss who received all the passage. Bickley, Weaver, and Ford (2) then deleted words in certain grammatical categories from the reading passage and examined the effects this had on the number of correct responses to multiple-choice items concerning their passage. In the case of single grammatical categories they found that only the deletion of nouns had a significant effect on the number of items answered correctly.

Louthan (9) extended the reading blackout literature to the seventh grade level. He found that scores under the nouns deleted condition and the verbs deleted condition were significantly lower than those obtained under the control condition in which the reading passage was unaltered. Bhooma (1) examined the effects of certain deletions on he performance of sixth-grade students on standardized reading tests. The results showed the deletion of nouns produced a significant decrease in performance on the reading tests.

Mitchell (10) examined the performance of fourth-grade students on a reading comprehension test in which the reading passages which were related to the test questions were deleted. The results showed that a high percentage of the items on the reading comprehension test were correctly answered at a level higher than could be expected to occur by chance.

METHOD

Hypotheses

The following hypotheses were generated from the literature related to the objective of this investigation:

(1) The mean of the number of multiple-choice items answered correctly will increase with grade level.

(2) The mean of the number of multiple-choice items answered correctly under the All Words Deleted condition will increase with grade level.

(3) The subjects who are assigned to the All Words Deleted condition will supply answers to the multiple-choice items at a level which is greater than chance.

(4) The Nouns Deleted condition will be the only grammatical deletion which will cause a significant decrease in the number of multiple-choice items answered correctly when compared with the No Words Deleted condition.

(5) There will be a significant difference between the number of multiple-choice items answered correctly under the All Words Deleted condition and the No Words Deleted condition.

Materials

The materials were paragraphs and the accompanying multiple-choice items chosen from reading tests applicable to third, fourth, and fifth grade levels listed in Buros (3) Sixth Yearbook. Those paragraphs which contained poetry or extensive dialogue were omitted, and the remaining paragraphs were classified as easy or hard by dividing the tests into halves and classifying the first half as easy and the last half as hard. This was done under the assumption that reading test paragraphs and the accompanying test items increase in difficulty from the beginning of the test to the end. Paragraphs were then sampled randomly from each difficulty and grade level until a total of twenty-four paragraphs were chosen. These samples yielded seventy-three multiple-choice items which comprised the reading comprehension test used in this study.

The reading paragraphs presented to the Ss were altered to correspond to the specific treatment conditions, as follows:

1. Common nouns deleted.
2. Adjectives deleted.
3. Main verbs deleted.
4. Function words deleted.
5. No words deleted.
6. All words deleted.

The alterations took the form of deletions fashioned after Weaver and Bickley's (11) adaptation of Holland and Kemp's (8) blackout technique. The determination of the specific words to be deleted under each grammatical category was made in accordance with Coleman (5). The locations of the deleted elements were indicated by six space blanks to eliminate word-size cues. The multiple-choice items pertaining to the reading passages were not all altered in any way, and the Ss were instructed to answer all the questions from whatever information was available to them in their particular reading passages.

Subjects

The Ss were 180 third, fourth, and fifth-grade students enrolled in public schools in a rural northeast Georgia School System. The students at each grade level were divided into high and low reading ability groups on the basis of scores obtained on a previously administered standardized reading test. The Ss were then randomly chosen from the two groups and randomly assigned, at the appropriate grade and ability level, to the six treatment groups corresponding to the six treatment conditions.

Analyses

The raw data was found to be heterogeneous at the third-grade level so transformed ($\sqrt{X + 1}$) data was used in most of the analyses. The transformed data was processed by a two-way analysis of variance model. Mean comparisons were made where the main effects were

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found to be significant. A sign test was performed on the raw data for the All Words Deleted condition. An odd-even split-halves reliability study was also conducted. The .05 level of probability was the criterion for significance in each analysis and for each reliability coefficient.

RESULTS

The reliability coefficients for each treatment over all the grade levels ranged from .58 for the All Words Deleted treatment to .90 for the Main Verbs Deleted treatment. The reliability coefficients for each treatment over all grade levels were all significant at the .01 level.

Hypotheses

The hypothesis that the mean of the number of multiple-choice items answered correctly would increase with the grade level was not accepted. The two-way analysis of variance presented in Table 1 shows both main effects, grades and deletions, to be significant with no significant interaction between them.

TABLE 1
Two-Way Analysis of Variance: Transformed Data

Source	df	S.S.	M.S.	F
Grade	2	9.00	4.50	5.61**
Deletions	5	94.63	18.92	23.62***
Grade × Deletions	10	3.67	.36	.45
Error	162	129.80	.80	

** $p < .01$
*** $p < .001$

From this it was expected that the differences would be distributed rather evenly over the grade levels. The results shown in Table 2 indicated that the significant main effect of grade level was due to virtually identical performance at the third- and fourth-grade level as contrasted with significantly higher performance at the fifth-grade level.

TABLE 2
Comparisons of Grade Means Over All Treatment Conditions: Transformed Data

Comparison	Mean Difference	t-ratio	Relationship
3 : 4	.0281	.14	3 = 4
3 : 5	—.4597	—2.26*	3 < 5
4 : 5	—.4878	—2.31*	4 < 5

* $p < .05$ (df = 118)

When each treatment condition was considered separately no significant differences were found between the grade levels.

The hypothesis that the mean of the number of multiple-choice items answered correctly under the All Words Deleted condition would increase with grade level was not accepted. As stated above, no significant differences were found between the grade levels when each treatment condition was considered separately.

The hypothesis that Ss who received the All Words Deleted condition would correctly supply answers to the multiple-choice items at a level greater than chance was accepted. The exact number of Ss who scored at a level greater than chance under the All Words Deleted condition at each grade level was found, and a sign test was used to determine the exact probability of that number of scores occurring by chance. The probabilities for the third and fifth grade levels were .001 and the probability for the fourth grade level was .01. All these probabilities were well within the .05 criterion level for acceptance of the hypothesis.

These results showed that the Ss were able to answer the multiple-choice items without the aid of the accompanying reading passage at a level significantly greater than chance. This evidence supported the findings of Weaver and Bickley (11) and Mitchell (10) and also supported the contention that reading comprehension tests are measuring past learning, word association, irrelevance of distractors, and item conceptual-information constraints in addition to the ability to answer multiple-choice items directly from cues in the reading passage.

The hypothesis that the Nouns Deleted condition would be the only grammatical deletion which would cause a significant decrease in the number of multiple-choice items answered correctly when compared with the No Words Deleted condition was not accepted. The results presented in Table 3 show that performance under both the Nouns Deleted condition and the Adjectives Deleted condition was significantly lower than under the No Words Deleted condition.
This finding for the Nouns Deleted condition held true for all the grade levels and confirmed the other studies reported here. This finding for the Adjectives Deleted condition has not been confirmed by other investigators. Further analysis showed this finding to hold true only at the third-and fifth-grade levels. The older age groups used in the research reviewed in this study and the specific nature of the content of the reading passages at this age level may have something to do with the variable effect. There is also the strong implication that some artifact of task, administration, or random error was responsible for these results.

The hypothesis that there will be a significant difference between the number of multiple-choice items answered correctly under the All Words Deleted condition and the No Words Deleted condition was accepted. This is a consistent finding of all studies in this area and is the chief reason these conditions are used as control conditions.

TABLE 3
Comparisons of Treatment Means Over All Grade Levels: Transformed Data

Comparison	Mean Diff.	t - ratio	Relationship
Noun : Adjective	— .7474	—2.94**	Noun < Adjective
Noun:Verb	—1.3215	—5.12***	Noun < Verb
Noun : Function	—1.1824	—4.87***	Noun < Function
Noun : All In	—1.6018	—6.76***	Noun < All In
Noun : All Out	.4133	2.06*	Noun > All Out
Adjective : Verb	— .5741	—2.18*	Adjective < Verb
Adjective : Function	— .4350	—1.75	Adjective = Function
Adjective : All In	— .8544	—3.51***	Adjective < All In
Adjective : All Out	1.1607	5.59***	Adjective > All Out
Verb : Function	.1391	.55	Verb = Function
Verb : All In	— .2803	—1.13	Verb = All In
Verb : All Out	1.7348	8.15***	Verb > All Out
Function : All In	— .4194	—1.81	Function = All In
Function : All Out	1.5957	8.22***	Function > All Out
All In : All Out	2.0151	10.79***	All In > All Out

* $p < .05$
** $p < .01$
*** $p < .001$
df = 58

DISCUSSION

The results obtained in this study are mainly confirmations of the results of previous studies. This study does extend the findings to lower grade and age levels. The only deviation from previous findings is that removal of the grammatical category "adjectives" decreases the ability of subjects of the third and fifth-grade level to complete multiple-choice items successfully. Since there is no apparent psychological or linguistic reason that fourth-grade subjects should not fit a developmental pattern here, there is the strong implication that some artifact of task, administration, or random error is responsible for these results.

These results generally supported previous findings and also supported the contention that reading comprehension tests are measuring much more than the ability to answer multiple-choice items directly from cues in the reading display. It was concluded that reading comprehension tests are measuring other variables such as past learning, word association, irrelevance of distractors, and item conceptual-information constraints in addition to the ability to answer multiple-choice items directly from cues in the reading display.

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Intelligence of Adult Illiterates

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Many educators and psychologists working with black disadvantaged populations have been disturbed by the publication of Arthur Jensen's (2) views on racial differences in intelligence. Central points he developed include the following:

1. Intelligence tests essentially measure higher order cognitive thinking.
2. Blacks average about 15 IQ points lower than whites on intelligence tests.
3. Higher cognitive abilities are largely transmitted genetically. They are inherited, not developed.
4. Remedial or compensatory instruction is generally ineffective except for those few below a certain minimal "threshold" of adequacy.
5. Retarded children occur many times more frequently in all social class levels in Black populations than in white.
6. Gains in intelligence scores reported among black children in compensatory educational programs tend to be questionable and short-lived.
7. American Indians tend to have higher IQ scores than Blacks even though their circumstances appear even more disadvantaged.
8. Blacks tend to do well in rote learning.
9. Educational programs aimed at black disadvantaged populations should emulate instructional programs like the Bereiter-Engelmann kindergarten which emphasizes drill on specific basic educational elements.

THE STUDY

A study recently completed in Western New York would seem to have some bearing on Jensen's views. The study involved 128 functionally illiterate adults, each of whom were tested with a Wechsler Adult Intelligence Scale, chosen at the test instrument because of its accepted stature as an intellectual measure.

The sample population was over 95 percent black, mean age of 47, and all were enrolled in adult basic education courses in city core areas.

The aim of the study was to determine whether the scores on the WAIS indicated learning potential for this sample of adult illiterates. In order to do this, the subjects were tested with reading-related sections of the Stanford Achievement Tests before and after 200 hours of reading instruction. It was felt that the pre- and post-test differences were indicative of *functional* learning ability, and therefore were used as criterion scores. In other words, each subject was measured on the basis of his performance on the intelligence measure, and again on his actual ability to learn as indicated by his tested reading achievement after instruction.

FINDINGS

The results were divided into mean IQ test scores, and correlations between IQ measures and reading achievement.

Test Scores

Of the eleven subtests on the WAIS, eight had identical mean scaled scores of five points each. Since a scaled score of ten points approximates average performance, the results are significantly depressed, as may be seen by the mean Full Scale score of 70 IQ points.

Of the three subtests which varied from the mean, one, Comprehension, had a mean of six points; another, Block Design, a mean of four points; and the last, Digit Symbol, a mean of only three points (see Table 1).

An analysis of the subtests would indicate that five of them seem to require much more rote learning than abstract cognition. These five are Information, Digit Span, Vocabulary, Picture Completion, and Digit Symbol. In the Information subtest the subject is asked to recall specific bits of information such as the colors of the flag, the shape of a ball, or to tell who Longfellow was. These are all examples of recall of rote learning more than abstract thinking.

The second rote subtest is one in which the subject simply repeats a series of numbers after the examiner. Third is Vocabulary, in which he is responsible for the recall of word meanings. Fourth is Picture Completion, in which the subject looks at a series of simple drawings and identifies a part that is missing, such as a tooth from a comb, or a woman's arm which does not appear in a mirror reflection.

The fifth is the Digit Symbol subtest, in which the subject is given a key to a simple code and he must place the correct symbol from the key to a series of digits. Success requires him to be able quickly to learn the appropriate symbol for the proper digit, but it also requires him to handle a pencil quickly and efficiently, a dfficult task for an illiterate.

The mean scaled scores for each of the first four of these "rote learning" subtests was five points, and for the last, three points; an average of 4.6 points.

Four of the subtests appear to require somewhat more abstract thinking than rote learning. These four are Comprehension, Arithmetic, Similarities, and Block Design. Comprehension presents the subject with a problem situation ("What should you do if you are the first person in a crowded theater to smell smoke?"), or a proverb ("One swallow doesn't make a summer"—What does that mean?) and asks him to give an appropriate solution or answer.

The second subtest is Arithmetic, in which the subject is to listen to orally given problems ("If it took two men four days to dig a ditch, how many men would it take to dig it in half a day?") and solve the problem without using pencil or paper.

The third subtest in the category of abstract thinking is Similarities, in which the subject must be able to grasp essential likenesses between objects or ideas, and express them. ("How are an orange and a banana alike?")

The fourth subtest requiring abstract thinking is Block Design, in which the subject must duplicate patterns shown him by manipulating a set of blocks having either red or white or split red-and-white sides. This is a very challenging test, requiring higher cognitive skill.

Mean Scaled scores on these subtests requiring abstract thinking were six points on Comprehension, five points each on Arithmetic and Similarities, and four points on Block Design, averaging exactly five points.

If the point to be made is that fuctionally illiterate disadvantaged Blacks do far worse in the WAIS than a population of literate whites might be expected to, there would seem to be little room for argument. On the other hand, if being "Black and disadvantaged" manifests itself as having comparative weakness in abstract thinking, but comparative strength in rote learning, then the results do not tend to substantiate such a position.

Correlations with achievement

Pre and post-reading test differences were obtained as a measure of functional learning abilities. Pearson Product-Moment correlations were performed to attempt to determine the degree to which the WAIS and its individual subtests had been able to discriminate ability to learn to read.

The Digit Span subtest exhibited the strongest relationship to reading achievement with a correlation of .30. Other correlations which were significant were Picture Arrangement (.28), Digit Symbol (.23), Performance (.26), Full Scale (.25), and Verbal (.23). Other subtest scores were too low to be included.

In an attempt to increase the predictive strength of the WAIS, each of the eleven subtests was combined in a stepwise regression with the addition of weights and a constant. This only succeded in producing a multiple correlation of .34.

It may be seen by squaring the Full Scale correlation of .25 or the multiple correlation of .34 to obtain an approximation of the variance accounted for, that neither measure is very satisfactory. The Full Scale accounts for only about six percent and the multiple correlation only about eleven and one-half percent of the total variance. In other words, even by using a regression equation the WAIS does a poor job of predicting who can learn (to read) and who cannot in a population of black adult illiterates.

APPLICATION TO JENSEN'S POINTS

A re-examination of Jensen's nine central points in light of the study just presented would seem to lead to the following comments:

1. Intelligence tests essentially measure higher order cognitive thinking.

In the WAIS, a paragon among intelligence tests, this is not true. Of the eleven subtests, five require more rote learning, four require more abstract thinking, and two are indeterminate.

2. Blacks average about 15 IQ points lower than whites.
3. Higher cognitive skills are largely transmitted genetically.
5. Retarded children occur many times more frequently in all social class levels in Black populations than in white.
7. American Indians tend to have higher IQ scores than Blacks even though their circumstances appear even more disadvantaged.

With our present instruments these statements are impossible either to prove or disprove since there is no way of assessing *innate intelligence.* Even the measurement of pre-school intelligence is hardly worthy of the name except within the broadest of categories. Being born black has great significance in our society. It affects everything from diet to medical care to self-esteem. It seems likely that these effects manifest themselves from the earliest intelligence measures on.

4. Remedial or compensatory education is generally ineffective except for those few below a certain minimal threshold of adequacy.

"Them as has—gets" is a homely statement of fact affecting the disadvantaged. In an earlier study (1) this writer found that one of the greatest predictors of success in learning to read was the extent of the student's present reading. If he was totally unable to read, he made poor progress, but if he could read a little he could be taught to read more.

Remedial education tends to be a slow process, but the more one has, the more likely he is to be able to get more. The average reading gain during the study was slightly less than half a year, but some of these who came into the study finally having learned to read as high as second grade, made substantially higher gains. Probably those who have *least* hope of improving are precisely those "few below the minimal levels of adequacy."

8. Blacks tend to do well in rote learning.

On the basis of this study, Black adult illiterates tended to do just as well on tasks requiring abstract thinking as on those requiring rote learning.

9. Educational programs for disadvantaged Blacks should emulate programs which emphasize drill on specific educational elements.

Since this study did not confirm that black adult illiterates have poorer ability to do abstract higher cognitive thinking, it could not support a prescription deleting education requiring abstract thinking from the curriculum and emphasizing rote learning of unrelated specific educational elements. But beyond this, it seems that this ninth point is somewhat lacking in logic. We know that virtually everything asked on an intelligence test requires responses which have been learned. Intelligence tests are tests of learning achievement. It is therefore no more logical to say that since Blacks cannot do well in abstract learning (Jensen's point) they should be taught things requiring only rote learning, than it is to say that since they cannot do well in, say, arithmetic, we should try to teach them only to read.

Finally, Jensen's views need to be closely examined by many researchers and certainly by others outside the area of adult illiteracy. Some of his conclusions may be valid. The danger is that they may be considered valid without any attempt either to prove or disprove them.

TABLE 1
Mean Scaled Scores of Rote and Abstract Subtests of the Wechsler Adult Intelligence Scale

Rote Learning Subtests	Mean Scaled Scores	Abstract Thinking Subtests	Mean Scaled Scores
Information	5	Comprehension	6
Digit Span	5	Arithmetic	5
Vocabulary	5	Similarities	5
Picture Completion	5	Block Design	4
Digit Symbol	3		

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What is Reading Comprehension and How Should It Be Measured?

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The purpose of this article is to discuss four conceptually different variables in reading and then to evaluate existing measures of reading comprehension in terms of their potential for measuring these variables. The four aspects of reading which can logically be separated on a conceptual level are knowledge gained, amount comprehended, reading aptitude, and reading improvement.

At the outset, it is necessary that a distinction be made between an "indicant" and a "measure." Stevens (14) has stated that an indicant is the presumed effect or correlate bearing an unknown (but usually monotonic) relation to some underlying phenomenon, whereas a measure is a scaled value of the phenomenon itself. This distinction will be adhered to throughout the remainder of this paper in an effort to clarify the ambiguity often inherent in measurement discussions.

Knowledge gained refers to the increase in knowledge which results from reading a finite body of material. The term—knowledge—is being used here in much more the same manner as it has been defined in a published taxonomy of educational goals for the cognitive demain (Bloom, 1). Those who would prefer a precise definition of knowledge may refer to the taxonomy with its subcategories and numerous examples. However, the use of the term in the taxonomy restricts knowledge to behaviors and test situations, whereas knowledge in this article will be used as a hypothetical construct. Behaviors and test situations will be regarded as the performance indicants from which inferences can be made about knowledge. Viewing commercially available reading comprehension tests (e.g. *Nelson-Denny Reading Test)* as indicants of knowledge, however inadequate they may be in this regard, helps justify the fact that a large number of the questions on such tests can be answered without ever reading the passage upon which the questions are based. That is, traditional reading comprehension tests can be described as attempts to indicate the individual differences in the knowledge an individual has about the information contained in the reading passages. Viewed in this light, it is less disconcerting to find that many individuals know a good deal about the information contained in some reading materials before they read them. However, reading comprehension tests have been traditionally regarded as measuring something about the comprehension or understanding that takes place *during* the reading process itself. In this regard, traditional reading comprehension tests are failures.

"Reading comprehension" usually connotes, if not denotes, an understanding of the thoughts or ideas which the writer intended to communicate. Although this concept of comprehension has much in common with its use in the aforementioned taxonomy, the term will be used here as a reading construct that is much more restricted in meaning. Yet, the idea advanced in the taxonomy that knowledge precedes comprehension or that comprehension depends upon knowledge appears to be highly relevant to reading. Likewise, the extension of this hierarchical idea which considers "application, analysis, synthesis, and evaluation" as being dependent upon comprehension seems to be highly meaningful in reading. This background terminology helps to communicate the argument that traditional reading comprehension measures have been failures. They have failed as measures of comprehension in that they are indicating a mixture of pre-reading knowledge, post-reading knowledge, and amount comprehended. This mixed indicant has been successful in assessing individual differences in reading aptitude. The prediction of reading ability in specific reading situations probably involves a mixture of background knowledge and the specific ability to comprehend material when reading. Yet, the failure to discriminate between these two aspects of reading, i.e. "knowledge gained" and "amount comprehended," may be a retarding factor in the development of measurement techniques in reading.

An ideal measure of the knowledge variable should show very little gain from pre- to post-reading of a very easy paragraph or a very difficult paragraph. Thus, the relationship between knowledge gained and material difficulty should be an inverted U-shaped function like that reported by Coleman and Miller (12) for the relationship between gain, in guessing succeeding words on passages (Shannon's guessing technique), and material difficulty. Difficult paragraphs should show little gain in knowledge due to the relative ineffectiveness of only one reading of such difficult material. Easy paragraphs should show little gain in knowledge since these paragraphs usually contain little new information per a fixed amount of material, i.e. they are highly redundant. Yet, it would seem that an ideal measure of the amount comprehended from one reading of a paragraph should always increase as the difficulty of the material decreases. Furthermore, any measure of amount comprehended should show zero, or near zero, values prior to reading and dramatically sharp increases after only one reading. For mature readers who are reading easy paragraphs, the ideal measure of comprehension should show 100%, or near 100%, scores after only one reading of the material, and this ideal measure of amount comprehended should also result in a linear, or at least monotonic, relationship with material difficulty.

Reading aptitude has already been discussed as the variable that is being measured on most so-called, "reading comprehension" tests. This variable encompasses all the factors that contribute to the individual differences that exist with respect to general reading ability. Such variables as background knowledge, reading strategy, and other intellectual factors, may still be needed to account for individual differences in certain reading situations. Yet a good measure of reading aptitude should be able to predict the between individual differences in the ability to read a wide range of reading materials under various conditions. Most existing "reading comprehension" tests probably are quite successful in this regard.

Reading improvement refers to the within individual changes that take place in reading ability as a result of a treatment condition. For example, speed reading courses are currently being offered, commercially, that purport to improve an individual's ability to read. Presently available "reading comprehension" tests (i.e. reading aptitude tests) are being used in these courses to measure reading improvement even though these tests are usually not designed nor developed to measure within individual changes. (Although reading improvement has been chosen as the descriptive label, this variable is also the one that would be involved, for example, in a study of the possible detrimental effects upon reading of the prolonged exposure to a weightless condition, i.e. moon flight).

Armed with the above distinctions among knowledge gained, amount comprehended, reading aptitude, and reading improvement, it is easier to analyze the strengths and weaknesses of existing reading techniques. The four existing techniques to be discussed are the multiple-choice tests, cloze tests, Tinker test, and chunked test.

The most popular method for making inferences about reading comprehension has been through the use of multiple-choice questions. It appears that these tests perform very well the task that they are usually designed to perform, that is, discriminate among individuals. In this sense, they are excellent measures of reading aptitude. However, it is impossible to know the extent to which these tests are indicating knowledge gained or amount comprehended, and their use as reading improvement measures have been shown in certain instances to be severely lacking in validity (Carver, 8). Weaver and Bickley (16) contend that commercially available reading comprehension tests are highly dependent upon examinee characteristics which often have little to do with the reading test the examiner assumes he is presenting. They found that individuals who had no reading passage to aid in answering items sampled from standardized reading tests, nevertheless, answered 67 percent as many correct as individuals who had read the passage. This result has been supported by Carver and Darby (9) who found that a group of individuals who had not read the passages on the *Nelson-Denny Reading Test* nevertheless answered an average of around 40 percent correct. The currently accepted vague definition of what is meant by reading comprehension has provided part of the milieu that allows the traditional measuring devices to be measuring something other than the variable they purport to measure. Traditional focus upon norm-referenced measurement ((see Popham & Husek 13), i.e. individual difference measurement, has also contributed to the development of these measurement devices which Wright (17) has termed "no damn good." (Incidentally, Wright purports to have a working model wherein tests can be recalibrated to measure on an absolute scale rather than the traditional relative scale.) In many cases, existing multiple-choice tests are probably rough indicants of knowledge gained and amount comprehended. However, their precision is likely to be sub-standard in most situations.

The next technique to be discussed is the cloze test. In recent years there has been an accelerated use of cloze items as purported measures of reading comprehension. The cloze technique has been shown to be highly valid as an indicant of the relative difficulty or comprehensibility of reading material (Bormuth, 2), though its validity as an indicant of "readability" has been questioned (Carver, 6). For research applications, its use as a measure of "reading comprehension" appears to be gaining momentum in its competition with multiple-choice tests (e.g. Bormuth, 4). Probably, the most popular form of this test is the omission of every fifth word, i.e. 20% cloze, with exact word replacement required as a correct response. Coleman and Miller (12) reported that the cloze test failed as a potential measure of information gained due to such a small gain on paragraph reading from pre- to post-testing. Since it showed little gain as a result of reading, it does not seem to have potential as an indicant, much less a measure, of amount comprehended or reading improvement. As a measure of amount comprehended, it seems particularly undesirable since scores on the least difficult materials are often around 70% prior to reading and seldom fall below 30%, even for the most difficult materials. It does not seem rationally sound for an amount comprehended measure to produce a range of scores from 30% to 70% prior to comprehending, i.e. reading.

The next existing measure to be discussed is the *Tinker Speed of Reading Test.* This test has been used extensively and successfully by Tinker (15) to measure the effect of various treatment or condition variables (e.g. size of print) upon reading, but it has been used very little by other researchers. It is surprising that it has not been used more, as it appears to measure reading aptitude as well as other standardized tests. Carver and Darby (10) found that it correlated impressively with the comprehension scores on the *Nelson-Denny Reading Test* and the *Davis Reading Test,* .64 and .75 respectively. These correlations were probably severely attenuated by unreliability since the Tinker test, in the above study, was only five minutes long, and the published reliabilities of both the Nelson-Denny and Davis are less than .90. Considering the less than perfect reliability, the above correlations are even more impressive. The Tinker test provides a measure that holds comprehension constant while measuring changes or differences in reading rate. Although the past research on the Tinker seems to indicate that it would be an excellent measure of the changes that supposedly take place within individuals as a result of reading improvement courses, it offers little as a technique for measuring knowledge gained or amount comprehended from a specific body of reading material.

The final existing measure to be discussed is a recently developed measure of information stored during reading – the *Carver-Darby Chunked Reading Test* (CDCRT) (11). Since the CDCRT is possibly the only reading test that has been designed and developed to measure the changes that take place as a result of reading, the background, nature, and function of this test will be briefly discussed. First, the "chunked" type of test item was suggested and evaluated as a new measure of reading and listening comprehension (5). Then a standardized test was developed (9) and analyzed (10) using this type of item. The standardized chunked test is similar to other standardized reading tests in that it requires an individual to read a passage and then be tested on it. However, the chunked test on a reading passage consists of the original passage retyped in groups of one to five meaningfully related words. Each group of words is called a "chunk." In developing the test, one out of every five chunks was randomly omitted and a new chunk was written to replace the omitted chunk. The replacement chunks were written to be different enough in meaning from the original chunk so that individuals could detect the changed chunk after they had read the passage, yet were not so different that individuals could detect them without reading the passage. A preliminary version of the test was tried out and the test was revised. The two criteria for the revision of items were: (a) if over 33% detected the chunk as being incorrect in the group that took the test without reading the passages, the item was revised, and (b) if fewer than 67% detected the incorrect chunk in the group that read the passages, the item was revised. Notice that the two above criteria are quite different from the criteria normally used for selecting items for standardized reading tests. In traditional test construction procedures, if the item is correctly answered by over 90% or fewer than 10% of the sample the item is omitted since it will not discriminate efficiently—50% being the most desirable value. It cannot be emphasized too often, however, that traditional test development procedures are designed to maximize differences between individuals rather than to create a measurement scale for the variable in question. The chunked test has been designed and developed so that it has validity as a measure of the changes which take place as a result of reading. In addition, the test has been shown to discriminate among individuals in reading aptitude as well or better than other standardized reading tests, and it would seem to provide an adequate measure of reading improvement. This test has not been designed explicitly to measure either knowledge gained or amount comprehended. Yet it would appear to be a likely indicant of either one or both of these constructs. Since it has reduced the effect of pre-knowledge to a minimum, it seems probable that it would correlate almost perfectly with a measure of knowledge gained. Since the degree of success on the test seems to be directly dependent upon the degree of understanding or comprehension of the material, it is also probable that it is an almost perfect correlate of a measure of amount comprehended.

The discussion of the various measurement techniques has been summarized in Table 1. The author has expressed his recommendations regarding the use of the various measurement techniques when making inferences about the four variables in reading. Notice that only the chunked test is considered as an adequate indicant of knowledge gained. Bormuth and Bortnick (3) probably have come the closest to establishing a procedure that is a good measure of knowledge gained, termed "information gained" in their report. Another potential measure of knowledge gained might be the cloze technique with synonym scoring instead of exact scoring. Notice also in the table that the CDCRT is the only existing technique which has been recommended as providing a good indicant of amount comprehended on the specific passages used on the test. Yet it should be pointed out that the chunked technique does not provide a solution to the problem of

TABLE 1

Recommendations Regarding the Use of Various Techniques When Making Inferences About Four Important Variables in Reading

	Measurement Techniques in Reading			
Variables	Multiple-choice (commercially available)	20% Cloze (Exact Scoring)	Tinker Speed of Reading Test	Chunked Reading Test (CDCRT)
Knowledge Gained	Do *not* use.	Do *not* use.	Do *not* use.	USE
Amount Comprehended	Do *not* use.	Do *not* use.	Do *not* use.	USE
Reading Aptitude	USE	USE	USE	USE
Reading Improvement	Do *not* use.	Do *not* use.	USE	USE

measuring amount comprehended. What is needed is a rationally sound technique for measuring amount comprehended that is as simple to develop and score as the existing cloze technique. A strategy has been suggested for developing such a procedure elsewhere (7).

It has been concluded that most existing techniques that are called "reading comprehension" tests are measuring variables which are correlates of but conceptually separate from measures of reading comprehension and, in this sense, these tests are imposters. There does not seem to be much hope for progress in reading research or practice until more precision is accomplished in the formulation of what reading comprehension is and how it should be measured.

In summary, it has been asserted that it is fruitful to discriminate between four aspects of reading—knowledge gained, amount comprehended, reading aptitude, and reading improvement. Knowledge gained refers to the new knowledge or information acquired during reading. Amount comprehended refers to the degree of understanding of the material that has been read. Reading aptitude refers to the individual difference aspect of reading that is being measured by most commercially avilable so called "reading comprehension" tests. Reading improvement refers to the within individual changes that result from such a treatment condition as a speed reading course. Presently used techniques in reading were evaluated in terms of their validity as measures and indicants of these four conceptually different aspects of reading. The *Tinker Speed of Reading Test,* only five minutes long, was recommended as a measure of reading improvement and reading aptitude. The chunked reading test was described and recommended as a standardized indicant of knowledge gained, amount comprehended, reading aptitude, and reading improvement. It was concluded that most commercially available reading comprehension tests and the exact scoring cloze technique were inadequate as measures or indicants of knowledge gained, amount comprehended or reading improvement and should be regarded and used as measures of reading aptitude only.

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Critical Analysis Versus Critical Reading

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The term critical reading or critical thinking has been used in a variety of ways by authors in the field of reading. The most predominant meaning found in literature has been one advocating a series of abilities acquired by a reader to interpret certain facts. Harris (5, p. 443) states that "one of the most important aspects of critical reading is the ability to detect and resist the influences of undesirable propaganda." Strang, McCullough and Traxler (12) tie critical reading to the act of finding out whether statements are true, free from bias or fair minded. Tinker and McCullough (13, p. 193) state "critical evaluation may be in terms of such factors as an author or publishers prestige, the detection of his bias, or the out-of-dateness of a publication." Strang and Bracken (11, p. 148) continue the same theme with the observation that "critical reading is a means of combating the propaganda which is found in the radio, television, and motion pictures." Zintz (14), McKee and Durr (7), and Carter and McGinnis (4) all continue the same theme that critical reading has as its major objective the teaching of children to discern propaganda and checking facts for their validity.

Certainly seeing propaganda or checking validity of statements is a part of critical reading. However, this minor part has grown out of proportion to the broad meaning critical reading should and must carry. Critical analysis is a process that involves taking the printed symbol and analyzing it with what the reader knows through actual or vicarious experience. It is organizing data in terms of a meaningful set of ideas with which events or data are analyzed through the thinking process. The content areas have been sorely neglecting this process and have become nothing but a reproduction of facts without any analysis whatsoever. This practice of just returning what has been presented might be seen in terms of a computer without a program. If on the input we put in X + Y and do not program the process the output will be identical X + Y. Most of today's schooling is involved in just such a process, data input—data output, but no program. Critical analysis then must be the program needed to digest, manipulate, consolidate, and evaluate data in terms of the world about them.

Aristotle (2) stated "Educated men are as much superior to uneducated men as the living are to the dead." How many live 5 and 6-year-old children do we relegate to the living dead each year by just pumping facts into them so that by the 4th grade they hate reading—poetry—music—even "school" and by the 9th grade become dropouts. (7) Maybe it is really a "drop in" to reality.

Aquinas (9) in the 13th Century discussed the means by which the intellect knows what is to be known. He used the basic senses as windows to knowledge and without them the intellect cannot know. To move a child or a student through all means of communication therefore would enhance his knowledge of the world about him. Audio-visual then becomes an intricate part of the learning process. Movement, listening, seeing, feeling, smelling thus becomes an important part of the analysis of what it is that is to be learned. Klausmeier (6, p. 225) in his discussion of Piaget's development of intelligent behavior says, "The older child will have no trouble in mentally building alternative classification schemes, and he will have no trouble comparing them." Yet thousands of college students go through scores of courses never learning a thing about the subject taken but are merely "passing through" for a grade. The length of the stages Piaget suggests and even the limits presented must be questioned in terms of observable behavior of young children. They are capable of abstracting far more than we now attribute to them. To capitalize on these expansions of the mind would enhance any program of teaching-learning.

Most teachers shy away from the teaching of critical analysis because of their own lack of knowledge as to its application or its development. There is no one prescription but rather a broad base which reaches right down into the Kindergarten. An expression of the mind in terms of the world around the students must begin early. The "new math" is a step in the right direction where theory, or the larger units, are presented and rote memory is not the end in itself. Parker (8) gives a broad basis for the development of the individual in his Structure of Balanced Schooling where the emphasis falls upon the child who has received training in specific skills and is afforded the opportunity to use them to gain an education.

A child who has taken his mother's grocery box and used it as a vehicle to blast off to the moon, has abstracted and gone outside of the room he sits in. He has begun to use his mind to bring experiences into his world. The kindergarten child who listens to a record of *Peter and the Wolf* or Claude Debussy's *Clouds* and expresses the feelings of floating in the sky or seeing the wolf sneaking about has abstracted beyond the music. The first grader who feels the fog roll in and the silence of the cat's feet and squirms in his seat or crawls on the floor (1) is the same person who will despise Shakespeare's *Richard the II*. The same child who used a cardboard box to go to the moon will look at physics as a bunch of formulas or the child who collected grasshoppers will view biology as a series of phylums to memorize and return to the professor. (Thank God it's over, I got a B.) The short stories that are read and explained according to right and wrong answers (teacher's answers, of course) without any relation to the meaning to the individual, all help to kill what was a natural development of the self in terms of environment and experience.

Critical analysis must be developed in order that students may take the printed sentence, paragraph, story, or set of facts and apply it to the world about *them* in a way that is meaningful to the learner. This is not to say that we abandon all that has been done before but agree that others, through our help and guidance, might arrive at some knowledge of life as it was, as it is, and as it might be. The student might see the worth of a discipline as a total entity and apply it to his world through understanding beyond the basic facts. History then would not be a series of dates and events but rather a series of human events that might help develop a stronger free society for man. "English" would no longer be a series of nouns, pronouns, gerunds, but rather a communication of events, happenings, or living persons whose problems and accomplishments reflect a part of the world about them. Teachers themselves must break the bonds of facts and help the students see the application of ideas. "Burn, Baby, Burn" is real, and unrest at what is now being offered in schools will continue until it is also made real. Developing young men and women capable of seeing beyond the page in front of them, using all the resources possible, is the result of hard work and a mind capable of critical analysis.

There are many sources that would help in achieving these objectives. One by Sanders (10) gives examples of various thought provoking questions in many curriculum areas. Bloom's (3) taxonomy is also a good guide of developing critical thinking within the class structure.

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A Study of Word Associations of Pre-school Children

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THE PROBLEM AND HYPOTHESES

This study examines the commonality (as defined by Jenkins, 1960) of associations of lexical and structural words. The results will be examined to determine whether or not learnability (as defined by Coleman, 1968) and sex are related to commonality of associations.

Any group of subjects will have certain common backgrounds, interests, education and vocabulary. These subjects will give some like responses to the stimulus words. These multiple responses to the same stimulus word are common responses, and this agreement will be called commonality. On the other hand, some responses are unique; i.e. they occur only by one subject, and there are greater and lesser degrees of commonality.

Although single stimulus words are not easily defined as either structural or lexical words, this study will consider lexical words as nouns, verbs, adjectives, and adverbs. These words are picture words i.e. words that have concrete representations or abstractions which can be categorized into lexical form-classes. Structural words are all the remaining words that complete our vocabulary and form the connecting links that indicate relations in the language and make it meaningful.

The hypotheses are these:

1. There are no differences in commonality of responses between lexical and structural words.
2. There are no sex differences in the commonality associations of lexical and structural stimulus words.
3. There are no differences in the commonality of associations of high learnability or low learnability words.

To continue the analyses, responses are categorized as either syntagmatic, paradigmatic, phonological, or indeterminate responses. Syntagmatic responses give a continuous thought such as "red-shirt." Paradigmatic responses are substitute words for the stimulus word as "car-truck" or fish-bass" as well as contrasting words "high-low." Words that rhyme with the stimulus words are phonological. Any word that does not fit into these three categories is classified as indeterminate.

The data are analyzed further as examining the relation of the number of letters, phonemes, and syllables to commonality of associations in structural-lexical categories. The word-type responses are classified into four categories (syntagmatic, paradigmatic, phonological and indeterminate) and their relation to structural and lexical stimulus words investigated.

The study also yields basic data on the association patterns of eighty pre-school children to one hundred frequently occurring words. These data are even more valuable since there is further information concerning these words such as their learnability and frequencies of occurrence. Such data are valuable for further experimentation on associational characteristics of subjects.

REVIEW OF THE LITERATURE

Fries (1952) defines lexical words as those with meanings recorded in the dictionary. In general, he classifies these words as nouns, verbs, adjectives, and adverbs. Structural (function) words are all the remaining words. Fries attempts to classify these structural words into fifteen groups, but he admits the difficulty. In single word associations, it is difficult to distinguish between some lexical structural words since the word classification often depends upon context. Ervin (1963) found that structural words elicit structural responses and that lexical words elicit lexical responses.

Entwistle (1966 b) in a normative survey went further than simply reporting norms. She noted that in the pre-school group the number of different responses for pre-school children decreased as age increased. She also distinguished the typical associate of the child from that of the adult. She called the childrens' associations which tended to follow syntactic structure (e.g. red-ball) "syntagmatic". Adult responses which tend to be words from the same class form she designated as "paradigmatic". She found that paradigmatic associations increased from kindergarten to the fifth grade as syntagmatic associations decreased. Deese (1962a) defined paradigmatic associates as words that can take the place of the stimulus word, and syntagmatic associates as words occupying other and generally contiguous positions. Deese (1962b) and Entwistle (1962a) both found that the most frequent responses by young children were nouns. McNeil (1966) stated that paradigmatic responses are the general rule for adult associations and that children younger than seven give few paradigmatic responses. He felt the limited vocabulary of young children may be a factor causing pseudo-syntagmatic associations. In this study McNeill found that paradigmatic responses were generated in associations tasks and not recalled. Miller (1951) stated that childrens' responses either complete or enlarge upon the stimulus word and observed that there is a systematic change in word associations with age. He further found the more homogeneous the background and experience of the subjects, the more similar their responses and the more paradigmatic associates. Jenkins (1960) described "commonality of association" as the degree of agreement with the "standard." High commonality is the greater agreement with the group and low commonality the lesser agreement.

Coleman (1968) took the 500 most common English words according to the Lorge Magazine count and the Lorge-Thorndike semantic count and proceeded to rank them according to the ease with which they could be learned. Coleman's results were placed into thirty-three levels of difficulty which he called "learnability."

PROCEDURE

One hundred words, fifty lexical and fifty structural, were chosen by inspection from the thirty-three levels of error in Coleman's list. Three words were selected from each level except for the two containing fewer than three words. Extra words were chosen from the other levels to round out the sample for these shortages. Care was taken to select fifty lexical and fifty sturctural words with as nearly the same difficulty range as possible according to Coleman's criterion.

The subjects were eighty kindergarten children ages five and six. Twenty male and twenty female students were randomly selected from two kindergartens.

For recording purposes by the examiner, each word was printed on a 5-by-8 card with its degree of difficulty and labeled lexical or structural. The cards were then randomly selected with the subjects giving their associations to twenty-five words. Each stimulus word received twenty responses, ten male and ten female. The children were individually interviewed and given the stimulus words orally since they could neither read nor write. The examiner visited the school prior to testing the subjects. They were prepared for the test by having their teacher inform them that they would have fun playing the game. The subjects were introduced to the examiner by the teacher. Rapport was established with each subject before the instructions were given.

The following instructions were given to the subjects:

"I want you to play a game with me. Here is the way we play. I will say a word and you will say the next word you think of. Like I may say chair and you would say ————. Now let us begin."

RESULTS

The null hypothesis that there is no difference of variables is accepted if the probability is equal to or less than .05.

The null hypothesis that there are no sex differences in the commonality of associations of lexical and structural stimulus words is rejected.

The T test was used to compute the chi square. The chi square showed a huge difference in the probability of commonality level by structural lexical stimulus words, probability of commonality level by sex, and the probability of responses to structural-lexical stimulus words by sex. Differences are attributed to the large commonality differences between words which received 2, 3, 4, ... n response commonality levels.

The null hypothesis that there are no differences in the commonality of associations of high learnability or low learnability words is rejected. The Pearson r of .272 with 98 degrees of freedom is significantly different from zero at the .01 level of confidence.

All four groups of twenty-five stimulus word groups were categorized as syntagmatic, paradigmatic, phonological, and indeterminate responses. The commonality by categories were not significant for all four groups combined, Group I, Group II, Group III, and Group IV. Group II was significant at the .01 level.

These categorizations, paradigmatic, syntagmatic, and phonological where analyzed separately by structural and lexical stimulus words and by stimulus word groups I, II, III, IV. The syntagmatic and paradigmatic categories were significant at the .001 level. The phonological category was not significant. The T test was used to compute all chi square values.

Distributional constraint, the geometric mean of the log-arithmic measure of the extent of agreement between subjects in associations, revealed there was greater agreement in lexical (3.85489) than in structural stimulus word responses (3.95653).

Eleven percent of the stimulus words received no multiple responses. One hundred and seventy-nine multiple responses were recorded by males and one hundred and ninety-two multiple responses by females.

CONCLUSIONS

The structural meaning and lexical meaning categories were analyzed by Fries (1952) in relation to adult oral language behavior Structural meaning was considered to be carried by function words and lexical meaning was carried by content words (nouns, main verbs, adjectives, and adverbs). When these word types are used in measurement situations, usually by the cloze technique (Weaver and Kingston, 1963), there are differences in structural and lexical categories. A search of the literature revealed no studies of intermediate age children on structural and lexical categories. Kingston and Weaver (1969) in a study of first grade children using the cloze procedure found no differences in the responses to structural and lexical cloze items. In the light of these studies, it is understandable that no differences were found when stimulus words were categorized as structural or lexical and the common responses to this dicotomy analyzed.

Association tests given orally have the fault of not distinguishing words that sound alike but having meanings that are completely different. One such word used was "so" that elicited such responses as buttons, clothes, what, cold, and soap.

Several contrasting pairs appeared as better-sick, big-small, boy-girl, down-up, and large-small. Rhyming with nonsense "words," was common even using nonsense words as after-nafter, company-mumpany, and humpany, country-muntry and duntry, and girl-tirl.

Subjects that seemed to be slow learners and subjects that appeared timid gave phonological responses as the majority of their responses. A study of the mental age as related to the categorized responses would be an interesting follow-up study.

Underwood and Shulz (1960) found that the responses given were those of high frequency use in everyday language situations. This was evidenced when the stimulus word "president" received three Nixon responses and one Jonhson response in addition to fourteen other different words. Seven out of twenty responses to the stimulus word "national" were "bank." The stimulus word "as" elicited the responses of "world" and "world turns" to show the popularity of a current television "soap-opera."

The situation relating to sex differences in associational studies is confused. Coleman (1968), Entwistle (1966), and Palermo and Jenkins (1964) found sex differences in adults and children. Jenkins (1960) found sex differences in commonality measures in and adult association study. On the other hand, Berko (1967) in a study of the acquisition of syntax found no sex differences in young children (ages 4, 5, and 6). Bickley (1969) in a serial learning study found no sex differences in learning serial associations in pre-reading first graders. The Coleman study (1968) was the only previous study that dealt directly with the associations of pre-school children. The sex difference was analyzed in the context of commonality of words. The lack of similarity here implies that commonality relations are not similar for the sexes, but this does not necessarily imply that all the responses to the words are different for different sexes.

There were more commonality responses to words which were easier to learn by the "look—say" flash card method of Coleman (1968). This is an interesting finding especially as Coleman found low correlations between frequency of occurrence of words and the value of his learnability criterion. This might imply that learnability is a better index of response commonality than is frequency. This speculation could not be tested in this study.

The syntagmatic and paradigmatic categories are defined as associates having the same form-class as the stimulus word (paradigmatic) and words not having the same form-class as the stimulus word (syntagmatic), but showing some sequence characteristics of the syntax of English. This categorization seems to interact to a large degree with subject and stimulus word variables. The one hundred words were given in groups of twenty-five in such a manner that one-fourth of the subjects responded to each list. Each stimulus list was composed of approximately equal numbers of structural and lexical words. When the commonalities of the entire group were assembled in structural and lexical categories there were no significant differences.

When the four groups were analyzed separately there was no significant difference in four. When the response categories, syntagmatic, paradigmatic, and phonological were separated and distributed alone with structural and lexical stimulus word type, the syntagmatic and paradigmatic categories were significantly different. The phonological category shows no difference. The structural category appears to exhibit differences in structural and lexical words due to differences in the four groups of twenty-five stimulus words. The paradigmatic difference appears to be related to the predominance of lexical responses over structural responses. This means means that paradigmatic responses are related to the commonality of lexical responses rather than the commonality of structural responses.

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Backgrounds, Felt Educational Needs, and Expectations of Adults Seeking Advanced Training in Reading

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Different people enroll in adult reading courses for different reasons. A newspaper advertisment noted in passing, an up-coming civil service examination, or simply a growing feeling that a wife, children, or circle of friends is managing better to "keep up" on current reading—any of these can be the spur that goads an adult reader to seek out, investigate, and finally enroll in a reading class.

Generally, however, the new enrollee has little definite knowledge of what to expect in a reading class. What information he does have is likely to be a conglomerate of copywriter rhetoric, romanticized memories of earlier educational triumphs, and perhaps a liberal dash of our typical American faith in machine technology as the ultimate answer to all things. Or, at least, such has been the feeling of many reading instructors.

Seldom, however, have the preconceptions, goals, and objectives of adults seeking out advanced training in reading been formally assessed. Though instructors have generally assumed a wide diversity of backgrounds, knowledges, and aspirations within each group of students, few have investigated the situation beyond the level of informal question-and-answer sessions early in the course of a training program. Thus, an attempt at learning more about these issues seemed reasonable to the investigators, and a study was undertaken.

METHOD

A questionnaire was constructed covering reading background, reasons for seeking out advanced reading training, and various aspects of personal knowledge and/or misknowledge about reading generally. Most items were rankings or forced-choice. This instrument was administered to 64 enrollees in an evening "Improve your Reading" course sponsored by University Extension, The University of Wisconsin, Madison, over a period of one year, the 1968-1969 academic year plus the summer term of 1969. Though partially subsidized by the university, these courses require the payment of instructional and laboratory fees, thus limiting the enrollment to persons of at least minimal interest and motivation and generally excluding full-time students entitled to some study-help and training as part of their regular university program.

Promotion of this program within the community is minimal, usually consisting only of an announcement in the tri-yearly published bulletin of extension courses, an occasional 8 to 10 line announcement in the local newspaper, and sometimes one or two "spot" announcements over the university radio station. Thus, little advance information beyond a course title is provided to the public, and whatever opinions the student brings to his first class session are pretty much his own.

The questionnaires were always administered during the first session of each eight-session series. An introductory paragraph stated simply that the information thus being collected was for the guidance of the instructor. Though this introduction was phrased in such a way as to imply voluntary cooperation only, no refusals to participate were encountered.

RESULTS

Upon analysis, the findings of the study appear to fall into six categories: (a) a description of the population in terms of sex, age, educational background, and occupations; (b) a survey of the reading and literary background the group brought to the course; (c) the reading habits and practices currently maintained by the group; (d) the group's felt needs and self-perceptions in terms of reading; (e) their pre-conceptions of what to expect in a reading course; and (f) their current knowledges and/or misknowledges about reading *per se*.

Description of the Group.

Of the 64 respondents, 39 (61%) were men and 25 (39%) were women. Ages ranged from 17 to 65, with a mean age of 30.8 years (σ = 8.6 years). All had at least 12 years of education (15.6%) and 54 (84.4%) had more than 12. Within the group, 24 (65.6%) held Bachelor's degrees, 10 (15.6%) also had Master's degrees, and 8 (12.5% had some kind of doctoral-level degree—two Ph.D.'s, three M.D.'s, two doctorates in dentistry, and one Doctor of Jurisprudence degree.

As these strikingly high educational backgrounds would suggest, most were professionals. Within the group, however, there were also several non-professionals: nurse's aids, clerks, salesmen, one plumber, a few graduate students (though one wonders why they would pay for these evening courses when equivalent daytime courses are provided free), and one laborer at the local sausage factory. Housewives were noticeably absent; only four of the 25 women (16%) reported this category, with one qualifying it by pointing out that she also produced and sold original art work, thus making her a "housewife-artist." Evidently housewives, usually considered the bread-and-butter proportion of the self-improvement class world, are either confident of their reading or have not as yet extended their interests to include it. The other possibility, of course, is that the part-time employed within the women chose more often to identify themselves with their out-of-home activities than with homemaking.

A final part of the personal data section asked for any physical, sensory, and/or personal and home problems needing to be considered by the instructor in planning and evaluating the enrollee's program, but none were ever listed.

Reading Background of the Group.

When asked to look back on their childhood reading environment, 32.8% reported a great deal of reading activity about their homes, 39.4% a moderate amount, and 29.7% very little. Two persons (3.1%) reported reading at present, but not in English. The major (95.3%) spoken language of their homes was English. In characterizing their *present* home reading environments, 48.4% reported a moderate amount of reading activity, 35.9% a great deal, and 15.6% very little.

Reading Habits of the Group.

Several questions dealt primarily with books and book-reading. The first one—about the approximate size of their own personal libraries=showed a great deal of variance (range: 0 to 2,000 volumes), with a mean of 176 ($\sigma = 315.3$).

When asked how they obtained most of their books, 54.7% reported buying them, 42.2% listed borrowing (primarily from libraries), and 3.1% reported receiving them as gifts. To guide their book selection, 35.9% relied mostly on the advice of friends, 34.4% browsed, 25.0% relied primarily upon published reviews, and only 4.7% regularly sought the help of librarians. Surprisingly (since so many *bought* most of the books they read), only two persons (3.1%) reported belonging to a book-buying club.

When asked to rank what three *types* of books they most often read, "fiction" and "technical" were the most heavily rated categories by far (35.0% and 33.3%). For a second choice, fiction was listed another 22.9% of the time, and "hobby-books" drew 18.8%. Third choices were about equally scattered among "politics," "self-improvement," and "biography." "Religious books," "drama," and "poetry" were rarely noted at any level. Titles listed as examples were generally heavy, academic, and technical, or representative of typical "book-of-the-month" fare. They reported reading an average of 2.4 books per month (range: 0 to 20, with many citing fractions of less than 1). "Yesterday" 31.3% had read a book, 21.8% had read a book "some days ago," 28.1% had read one "some weeks ago," and 18.8% reported either that it had been months since they'd read a book or that they couldn't recall the last time.

The next section dealt with magazine reading. Subscriptions per person ranged from 0 to 19 ($M = 3.44$; $\sigma = 2.96$), with an additional mean of 1.45 magazines each (σ = 3.3; range: 0 to 20) regularly bought each month at newsstands.

When asked about their newspaper reading habits, the group reported spending a daily average of 32.06 minutes (σ = 25.4 minutes; range: 0 to 120 minutes) in this way. Only 35.9%, however, regularly read other than a *local* newspaper.

Self-Perceptions and Felt Needs Concerning Reading.

When asked to categorize themselves quantitatively and qualitatively as readers, 20.3% termed themselves "heavy" readers, 46.9% as "moderates," and 32.8% as "light" readers. While 60.9% considered themselves "moderately" skilled at reading, 37.5% considered themselves "poorly" skilled, and only one person (1.6%) considered himself "quite" skilled. A large majority (77.4%) reported having concentration problems while reading.

Each respondent was also asked to estimate his current reading rate and his "goal" rate for the course. The mean estimate given for current rate was 250.8 words per minute (σ = 69.85; range: 50 w.p.m. to 500), not too far below their actual incoming average rate of 280 (range: 82 to 571). The mean "goal" rate for the group was 657.3 w.p.m. (σ = 323.3; range: 100 w.p.m. to 1,500).

When asked their major reason for wanting to improve their reading skills, many cited two or more reasons. The meeting of leisure reading needs (46.9%), meeting the reading needs of a current job (32.8%), meeting the reading needs of future intended schooling (29.7%), and keeping pace with friends and associates (17.2%) were the major ones noted. Only a few (7.8%)were concerned with the reading needs of new jobs being sought or with keeping pace with other members of their own immediate families (7.8%). Three persons (4.7%) were concerned with up-grading their ability to read English as a second language.

This heavy concern for the reading needs of future schooling (29.7%) was supported by the fact that 31.3% were currently enrolled in some other course besides reading, and 51.6% had plans for taking such courses in the near future. In both cases, university classes were the major target courses (80.0% currently and 69.7% intended). Other intended educational programs were technical school, business college, and correspondence courses.

When asked what kinds of reading materials were of most personal concern to them, academic (34.4%), technical (26.6%), non-fiction (15.6%), and literary (14.1%) were cited as first choices. Second and third choices were also high for these materials; but "mass-media" and "reference" materials were seldom noted at all, even in second or third level positions.

When asked what major personal gains they hoped to realize from the course, 67.2% cited an increase in rate as their first consideration and 29.7% an increase in comprehension. As a second consideration, these two factors were reversed, 25.0% and 42.2%. Third-level expectations were study-skills improvement (34.4%), vocabulary growth (20.3%), and better leisure-reading skills (18.75%).

Pre-Conceptions about the Reading Course

The first question asked here was how enrollees had become aware of the course. Most reported the regular, public channels of information: posted announcements 21.9%, newspaper announcements 20.3%, and the Extension catalogue 12.5%. A good number, too, (18.8%), had taken the advice of a friend who had recently completed the course. A smaller number had responded to a family (6.3%) or place of employment (6.3%) suggestion. Only one person (1.6%) had heard about the course over the university radio station.

When asked what types of teaching-learning methods they expected to be emphasized in the course, most listed individual (54.7%) and group (20.3%) drill and practice as major. As a second-level expectation, tests of reading ability (32.8%) and lectures (15.6%) or demonstrations (14.1%) by the instructors were cited most often. The matter of "discussions with the entire class" was singularly *not* expected: only one person listed it as first, two persons as second, and five (7.8%) even as third. Evidently these respondents rather clearly saw reading improvement as hard work, but definitely on an individual level.

When asked what kinds of materials and/or media they expected to *use* in the course, workbooks (35.9%) and machines (32.8%) were the heaviest first choices. As second-level and third-level expectations, workbooks (32.8% and 20.3%) and specially-prepared materials (25.0% and 25.0%) were the most often cited. "Library-type books (novels, etc.)" were very *seldom* expected: only one person checked this option as a first possibility, only four persons as a second, and only seven (10.9%) even as a third. Clearly, most persons expected to be reading something "special" or "different."

Knowledge and/or Misknowledge about Reading.

A final section of the questionnaire consisted of ten true-false items, nine of which dealt with generalizations about reading. Almost all (91.9%) felt that average readers could increase their reading speed to above 400 w.p.m., and 72.6% rejected the idea that such increases would have to result in lowered comprehension, or (95.2%) that rapid readers usually have poorer overall comprehension than do slow, careful readers. Most realized (79.0%) that posing questions before reading was a good reading technique and that "mouthing" the words (88.7%) was not. They rejected (69.4%) the generalization that efficient readers do most of their reading at only one high rate of speed, and accepted (90.3%) the fact that vocal-cord movement can take place even in the absence of lip-movement. Their overall perception of reading primarily as a *visual* act was demonstrated by their view (74.2%) that quick, jerky eye-movement had to be eliminated for fast reading and (71.0%) that efficient readers were always clearly *conscious of*, and thereby able to control, their own eye-movements while reading.

SUMMARY AND DISCUSSION

From the results found, the following generalizations appear to be sound, at least in terms of population seeking advanced training through this particular program:

1. A typical enrollee would be male, about 30 years old, with at least a Bachelor's degree and some professional standing. Females enrolled will probably be working women of at least semi-professional status.
2. Almost all come from, and currently maintain, English-speaking homes characterized by a moderate amount or more of reading activity. Most have moderately-sized personal libraries, additions to which are more often than not selected on the advice of friends or by browsing. Though a good many also use libraries as a source of books, few utilize librarians as aids for book selection.
3. Favorite types of books for this group will be popular fiction, hobby-books, and academic-technical materials. Most read regularly, finishing two to three books each month throughout the year. In addition to their book reading, most also read five or six magazines regularly, subscribing to three or four of them and buying the others at newsstands. Most also spend approximately one-half hour per day with a newspaper, usually one published locally.
4. Most enrollees see themselves as light or moderate readers, only moderately or poorly skilled at reading. They generally underestimate their current rate of reading.
5. Most hope, and anticipate, that rate of reading will be their major gain from advanced training in reading. This desire comes primarily from an interest in doing more leisure-reading, meeting their current professional-reading needs, and pursuing more formal education.
6. Most find out about the reading improvement course either through public announcements or through friends who've taken the course. When they enroll, they expect to be assigned a good deal of group and individual practice and drill with workbooks, machines, and specially-prepared materials. They do *not* expect literary materials or group discussion. They tend to be confident about their chances of increasing—even as much as 100%—their rate of reading while experiencing no loss in comprehension.
7. Finally, they tend to see reading as primarily a *visual* task, with conscious, purposive training of eye-movements essential to increased efficiency.

The Effects of Test Item Validity on Total Test Reliability and Validity*

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A reading comprehension test poses some interesting questions about what makes a test item valid and what happens to the total test validity and reliability in the face of poor items. For example, if the majority of a test population can answer a test item correctly without having read the selection on which the test item was based, what does it mean in terms of the test's ability to measure comprehension?

The purpose of this study was to investigate the effects of test item selection on total test reliability and validity. Put another way the question was, do various poor items on a test affect total test reliability and validity? The test selected for this study was the Reading Comprehension sub-test of the Nelson-Denny Reading Test Form A, (3). This test is suggested for use in grades nine to sixteen.

CRITERIA FOR ITEM ASSESSMENT

Item assessment criteria of good and poor items for a multiple-choice test are traditionally the items' difficulty and discrimination. Those statistics have been developed for studying test items which have as their major purpose the measurement of the attainment of knowledge in a particular area; however, they do not seem to be valid criteria for assessing items which attempt to measure reading comprehension and which use information gain as the criterion. Test item difficulty and discrimination are concerned with whether or not certain numbers of examinees get an item correct and whether or not those that score high on a total test are more likely to get an item correct than those who score low on the total test. These indices do not provide any evidence about a test item's validity for measuring reading comprehension.

This study has utilized different criteria for examining whether or not an item is a valid measure of reading comprehension. These criterial are based on an article by Marks and Noll (2). The procedures used in this study are based on Marks and Noll's concept that a reading or listening comprehension test attempts to measure performance which is different from a normal achievement test and, therefore different criteria should be used for examining item validity. For exam-

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ple, on the usual academic achievement test the examiner is concerned with measuring the examinees' knowledge in an area, regardless of how he gained that knowledge. In a reading comprehension test the knowledge that examinees display is of interest only as it is a valid measure of how much a student learned from reading or comprehending a stimulus paragraph.

In order to determine whether an item is measuring information gain, Marks and Noll suggest that the test items from a reading comprehension test be administered to a group of examinees—*without* the stimulus paragraphs. That exercise may be identified to examinees as a fact test and could be administered with some type of directions indicating that the test is attempting to measure whether students are familiar with certain phenomena. The test is then readministered at a later time using normal procedures, that is, the examinees are given the stimulus paragraphs to read and the questions to answer. In both testing situations the questions are presented to the examinees just as they appear on the regular test. From this procedure there are four performance possibilities for each examinee on any single item. A student can get an item correct under both testing conditions (RR); he can get an item wrong both times (WW); he can get an item wrong the first time and right the second time (WR); or he can get the item right and then wrong (RW). If a student got a particular item right both times, it would mean he got the item right without reading the stimulus paragraph, and then he got it right after he had read the paragraph. Incorrect both times, would indicate, of course, that he had it wrong before he read the material, and he also got the item wrong at the second testing. The right-wrong possibility would indicate that he got the item right before he read the material, but under the normal testing conditions he got the item wrong. The final possibility is that he got the item wrong before he read the material and that at the second testing he got the item right.

It seems logical to assume that if this procedure was with a reading comprehension test it would be expected that each of these four possibilities would occur to some extent by chance. However, one criteria for selecting poor items could be that more examinees get an item wrong-right than those who get it right-wrong. If more students got an item right-wrong, it would seem to indicate that something in the reading selection is misleading students. A second criterion for item assessment might be to examine the number of students who score right-right on a particular item. An exceedingly high number of students in this category would seem to indicate that the test item is measuring something other than reading comprehension. Perhaps examinees are answering the question correctly from background information, or in some way the item is giving away the correct response, or the examinees may be able to answer the question correctly from using information from other questions.

It is quite evident that these criteria differ from the traditional item indices of difficulty and discrimination. As Marks and Noll state in their paper, "It is evident that this kind of task (reading comprehension) is different structurally from tasks relating to achievement where an understanding of the rule is assumed and the subject is to deal appropriately with the elements. This difference in testing procedure gives rise to a question concerning the appropriate methods for evaluating this particular type of test. An underlying assumption of this paper is that the standard psychometric procedures—e.g., the estimation of discrimination and difficulty indexes and other aspects of item analysis—are not fully appropriate for evaluating the typical reading or listening comprehension tests." (2, p. 335)

The study reported here has used the Marks and Noll procedures for assessing test items and has tried to determine whether their criteria and procedures for item selection have any effect on total test reliability and validity . To determine the effects of poor items on test reliability, Kuder-Richardson test reliability coefficients were computed after specific poor items were dropped from the test. (1, p. 281) To determine the effects of poor items on test validity, a validity criterion was needed. A cloze reading comprehension test developed from the reading selections of the Nelson-Denny test was used for this purpose. The correlation of the total test with the cloze test was computed each time specific poor items were dropped from the test.

PROCEDURES

Two populations of students were selected for the study. The first population was a group of 130 college sophomores and juniors. No random sampling procedures were used in selecting this group. The second population was a group of 356 high school juniors from a suburban, middleclass Indiana high school.

The college level students were administered the fact test in October, 1968. The fact test consisted of 36 multiple choice items taken from the Comprehension subtest of the Nelson-Denny Test—Form A. The test was untimed, and the students were told that the test was part of a study to compare college students' general background information. Three weeks later the Comprehension Subtest of the Nelson-Denny Reading Test—Form A was administered to these same students. This test was also untimed; this, of course, deviates from the standardized test directions which specify that examinees are to be allowed twenty minutes for the test. Any student who did not take both tests was dropped from the analysis. This procedure resulted in a final sample of 115 students. The number of students getting each item right-right, wrong-right, right-wrong and wrong-wrong was then tallied. This analysis was used as a comparison for the high school juniors' performances. However, the effects of poor items on total test reliability and validity were not studied for this college population because the students scored at a very high level under both testing situations.

In September of 1969 the same fact test was administered to 110 high school juniors randomly selected from a total population of 356 junior class students. At the same time 150 students were randomly selected from the same junior class population and were administered a cloze test based on the reading selection of the Nelson-Denny Reading Test—Form A. No student was administered both the fact test and the cloze test. The cloze test was developed by deleting every tenth word from the Nelson-Denny reading selections and substituting a blank. In order to avoid student frustration over a lengthy cloze test, the cloze test paragraphs were divided into two separate forms. Each half of the cloze population examinees was administered one form of the test. Of the 150 students who took the cloze test, 24 did not complete the test and these test papers were deleted from the analysis. The cloze test was untimed, and therefore we concluded that students who did not finish probably found the task too frustrating; however, they may also have not been interested in the task or refused to continue working for other reasons. A total of 126 students completed the cloze test.

Three weeks after the fact test and the cloze tests were administered, those students who had taken the fact test were administered the Comprehension subtest of the Nelson-Denny Test—Form A. These tests were supposed to be untimed. However, several of the teachers who administered the tests followed the standard directions and timed the test. For this reason a number of students did not complete the test. Two alternatives were considered. First, the papers of those students who had not completed the test could have been deleted. Secondly, those items which had not been completed could have been deleted. Because of the possible biasing effects of eliminating the total tests of students who had not finished, it was decided to eliminate items. Upon examination of the test papers it was found that all but two students had completed 32 of 36 items. Therefore, the last four items were deleted from the analysis. Because these four items were all based on the last or eighth reading selection, that selection was eliminated from the cloze test papers. This meant that the analysis for the high school students was based on 32 items and seven reading selections.

As with the college level population, the number of students getting each item right-right, wrong-right, and wrong-wrong was then tallied. A Kuder-Richardson reliability coefficient was then computed for the results of the second test administration. That test was, of course, the normally administered comprehension subtest. The tally of items was then examined and eight items were dropped. The reliability was then calculated for the remaining 24 items. Following a second inspection of the item data, three additional items were deleted, and the reliability was again calculated.

To determine the effects of the item analysis on test validity, a coefficient of the correlation of the 32 item reading comprehension test with the cloze test raw scores was computed. Following the deletion of eight items the correlation was computed; finally, three additional items were deleted and the correlation was again computed.

RESULTS

The results of the testing with the college level population will be considered first. Inspecting the item analysis data in Table 1, reveals that for items 12, 14, 24, 32, and 36 more students or nearly more students got the items right-wrong that got the items wrong-right. In addition for items 6, 9, 11, 12, 14, 18, and 30 over 70% of the students got the items right-right. This analysis reveals that a total of 10 of the 36 items are of questionable validity.

The item analysis for the high school juniors also uncovered a number of questionable items. For items 8, 12, 14, 19, 25, 27, 30, and 31 the same number or more students got an item right-wrong than got it wrong-right. In addition for items 4, 9, 11, 14, and 25 large percentages of the students got the items right-right. The analysis for these students uncovered 11 questionable items out of a total of 32 items.

The reliabilities of the various sets of items for high school juniors are included in Table 3. The reliability of the total test of thirty-two items was .85. When eight items which were high in the right-wrong category (8, 12, 14, 19, 25, 27, 30, 31) were dropped, the reliability dropped slightly. When an additional three items which were high in right-right category (4, 9, 11) were dropped, the reliability again dropped slightly.

The correlations of the various sets of items with the cloze tests are included in Table 4. The correlation of the total thirty-two items with the cloze test was .55. When the eight right-wrong items were dropped, the correlation was .56.

CONCLUSIONS

It was hypothesized that dropping poor items from a reading comprehension test would increase the reliability of the tests, but it did not. It is true, of course, that there was a slight movement downward in the reliability scores as two different sets of poor items were deleted, but that movement seems to be a reflection of the fact that there were fewer items on the test and is probably not a true indication of a change in reliability.

A second hypothesis was that dropping poor items from a reading comprehension would increase the validity of the test. Just as in the case of the reliability coefficients, so the validity coefficients remained

TABLE 1

Item Analysis for the Reading Comprehension Subtest of the Nelson-Denny Reading Test for a Group of 115 College Sophomores and Juniors

Item Number	RR	RW	WR	WW	Total
I 1	35	00	78	02	115
2	37	03	63	12	115
3	48	01	64	02	115
4	40	00	74	01	115
5	32	03	76	04	115
6**	81	08	22	04	115
7	30	02	78	05	115
8	15	11	58	31	115
II 9**	89	04	22	00	115
10	19	00	91	05	115
11**	85	01	28	01	115
12***	84	18	12	01	115
III 13	44	02	67	02	115
14***	88	10	14	03	115
15	08	02	99	06	115
16	10	02	61	42	115
IV 17	53	08	51	03	115
18**	87	00	27	01	115
19	19	05	58	33	115
20	16	03	77	19	115
V 21	11	00	96	08	115
22	17	04	76	18	115
23	10	02	89	14	115
24*	31	26	28	30	115
VI 25	68	04	38	05	115
26	47	08	36	24	115
27	22	02	73	18	115
28	06	02	57	50	115
VII 29	49	04	48	14	115
30**	88	08	17	02	115
31	53	16	29	17	115
32*	30	32	25	28	115
VIII 33	24	01	85	05	115
34	23	04	72	16	115
35	04	03	85	23	115
36*	13	26	23	53	115

* High RW   ** High RR   *** High both RW and RR

TABLE 2

Item Analysis for the Reading Comprehension Subtest of the Nelson-Denny Reading Test for a Group of 87 High School Juniors

Item Number		RR	RW	WR	WW	Total	Item Difficulty	Item Discrimination
I	1	16	1	54	16	87	80	0.53
	2	17	18	19	33	87	41	0.50
	3	22	5	35	25	87	66	0.40
	4**	24	3	39	21	87	72	0.48
	5	6	5	40	36	87	53	0.46
	6	15	13	22	37	87	43	0.41
	7	3	6	30	48	87	38	0.50
	8*	12	20	20	35	87	34	0.10
II	9**	44	14	17	12	87	69	0.61
	10	22	9	41	15	87	72	0.54
	11**	38	12	22	15	87	69	0.55
	12*	24	21	19	23	87	50	0.25
III	13	20	6	32	29	87	60	0.53
	14***	31	23	9	24	87	46	0.61
	15	3	0	41	43	87	51	0.63
	16	7	6	21	53	87	31	0.20
IV	17	18	13	25	31	87	48	0.56
	18	23	14	15	35	87	44	0.53
	19*	17	19	16	35	87	38	0.32
	20	11	6	31	39	87	48	0.39
V	21	6	5	43	33	87	56	0.39
	22	11	9	32	35	87	49	0.18
	23	3	3	39	42	87	47	0.46
	24	7	14	19	47	87	30	0.40
VI	25***	20	15	12	40	87	37	0.68
	26	5	16	21	45	87	30	0.05
	27*	10	20	17	40	87	31	0.41
	28	2	7	26	52	87	32	0.20
VII	29	20	13	14	40	87	39	0.26
	30*	26	25	11	25	87	43	0.53
	31*	9	24	10	44	87	22	0.31
	32	3	11	16	57	87	20	0.15

* High RW
** High RR
*** High Both RW and RR

TABLE 3

Reliability Coefficient* for selected items on the Reading Comprehension Subtest of the Nelson-Denny Reading Test

Number of Items	Kuder-Richardson Reliability	Standard Error of Measurement	Number of Subjects
32	.85	2.45	87
24	.80	2.05	87
21	.75	2.05	87

* A test-re-test (alternate forms) reliability of .81 is reported in the test manual.

consistent enough to reject the notion that the deletion of poor items would change it.

The students' difficulty with the cloze test procedure may have had an effect on the validity of these scores. Students sometimes became quite frustrated in working on the cloze comprehension exercise and simply refused to proceed. The 24 students who did not complete the cloze tests may have reduced the variability in cloze test scores. This assumption raises a question concerning the validity of the cloze test as a criterion test for measuring reading comprehension. If 20% of the students fail to respond to the cloze test when every tenth word is deleted (a comparatively easy cloze), a substantial element of the test population has no criterion test.

Thus, it is concluded that the deletion of poor test items does not affect total test reliability or validity as those have been defined above. However, this negative conclusion does not alter the fact that a large number of questionable test items was discovered. It is quite probable that the definitions of test reliability and validity used in this study are not valid criteria for studying effects of deleting poor items. An inspection of the identified poor items is convincing evidence that the Marks and Noll procedures should be used for studying item validity for a reading comprehension test.

For example, item 11 is a direct giveaway from the wording of item 10. In fact 44% of the high school students and 74% of the college students got item 11 correct without reading the stimulus para-

TABLE 4

Correlation of selected items from the Reading Comprehension Subtest of the Nelson-Denny Reading Test with Cloze Comprehension scores on the Paragraphs of the Comprehension Subtest of the Nelson-Denny Reading Test

Number of Items	Pearson Product Moment Correlation	Number of Subjects
32	.553	87
24	.574	87
21	.562	87

graph. Item 9 which was answered correctly on the fact test by 51% of the high school students and 77% of the college students seems to be the correct choice because it is based on common experience, and the correct response also includes the other four choices. The reasons for 37% of the high school students and 76% of the college students getting item 14 correct on the fact test and on the reading comprehension test are not as easily discernable. However, common sense, background knowledge, and the fact that the word "king" was used in two alternatives in item 13 are possible reasons. There are other items that could be used as examples, but the point is that these items are often discriminating between those who score high and those who score low on a test, but they are not discriminating on the basis of the reading comprehension of the stimulus paragraphs.

The reasons for students' getting items right on the fact test and then wrong on the reading comprehension test are not as easy to determine. Often these items are "main idea" type questions where the keyed answer is debatable. Item 12 is an example of this situation. Twenty-four percent of the high school students got the item right on the fact test and wrong on the reading comprehension test; about ten percent of the college students did the same thing. This smaller percentage for the college students results from seventy-seven percent getting the item right both times. The correct answer to item 12 is "pursuit of perfection". Students are led to this answer on the fact test because the words perfect and perfection are used in previous items. However, the word genius is used synonymously at one point in the paragraph with the phrase "love of perfection". Item 24 is an example of the difficulty of agreeing on what a reading selection is mainly about. Fifty percent of the college students selected the correct answer on the fact test, but half of these students then got the item wrong in the reading comprehension test. The reason for the selection of the correct response (Henson) on the fact test is that the name Henson is used in the stem of item 22. However many of the college students, after reading the selection, thought the passage was mainly about "the discovery of the North Pole" rather than "Henson".

This study does not reject the use of item difficulty and discrimination as indices of good test items, but it does point out the need to apply other criteria to determine the validity of test items.

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Fact Test—Items from the Reading Comprehension Subtest of the Nelson-Denny Reading Test

GENERAL KNOWLEDGE TEST
COLLEGE STUDENTS

A. The following is a fact test concerning material with which college students are generally familiar. The questions are grouped into VIII sections. If a question is stated "With whom is this paragraph chiefly concerned" or "What does the author think," you should think of the paragraph or author as being represented by the *other questions on that section*.

B. Read each question carefully and select the response which you feel best answers the question and circle the letter before that answer. If you feel quite unsure about an answer you should guess. Do not skip any questions.

C. The test is untimed but you should probably finish in about fifteen minutes.

I

1. The Greeks considered Sappho as:
   1. The greatest woman poet.
   2. Dancer rather than poet.
   3. More musician than poet.
   4. Greater than Homer.
   5. The master of Epic poetry.

2. One may characterize the development of Greek poetry as:
   1. Static.
   2. Retrogressive.
   3. Superficial.
   4. Esoteric.
   5. Progressive.

3. Of the Greek poetry of that time:
   1. Much has survived.
   2. Very little remains.
   3. Most marble tablets remain.
   4. Most parchment manuscripts survived.
   5. Nothing remains except legend.

**4. Hesiod lived among whom?
   1. Shepherds.
   2. Slaves.
   3. Sailors.
   4. Priests.
   5. Philosophers.

5. The new poetry was spoken of as:
   1. Ornate.
   2. Patriotic.
   3. Impersonal.
   4. Personal.
   5. Crude.

6. The best inference is that poets:
   1. Reflect the times.
   2. Mold the times.
   3. Disregard the times.
   4. Are not appreciated in their own age.
   5. Are appreciated after they are dead.

7. What important poetic change did Archilochus effect?
   1. Rhyme scheme.
   2. Stanza length.
   3. Word form.
   4. Sonnet form.
   5. Metrical form.

*8. The most important change mentioned in poetry was change in what?
   1. Rhyme.
   2. Rhythm.
   3. Vividness.
   4. Religious overtones.
   5. Hero worship.

II

**1. One finds people with curiosity about their best self:
1. Only among the aristocrats.
2. Only among poor people.
3. Only among the poets.
4. In all classes.
5. Only among the Barbarians.

2. To certain aspects of the desire to be perfect, men have often given the name:
1. Ability.
2. Courage.
3. Initiative.
4. Genius.
5. Common sense.

**3. Such persons are concerned with the pursuit of:
1. Money.
2. Prestige.
3. Power.
4. Genius.
5. Perfection.

*4. What is the chief topic discussed in this paragraph?
1. Genius.
2. Culture.
3. Pursuit of perfection.
4. Passion.
5. The will of God.

III

1. With whom is the paragraph chiefly concerned?
1. The Tudor Kings.
2. The Plantagenet Kings.
3. The palace guards.
4. The London populace.
5. The English people.

***2. How were new laws secured when Parliament was not sitting?
1. They were made by a single London ward.
2. Old laws were revived.
3. They were made by the army.
4. The King issued an edict.
5. They were made by the Princes' council.

3. Under what guise were taxes sometimes collected?
1. Fines.
2. Loans.
3. Tariffs.
4. Commissions.
5. Sale of public offices.

4. What personal trait was always displayed by the rule of the dynasty discussed in the paragraph?
1. Cowardice.
2. Deceit.
3. Vigor.
4. Vacillation.
5. Forbearance.

IV

1. What is the chief topic treated in this paragraph?
1. Attempt to establish a constitution.
2. The levying of taxes.
3. The right to billet soldiers.
4. The break between King and Parliament.
5. The use of martial law.

2. Why did Parliament grant supplies sparingly to the King?
1. Taxes were too high.
2. Because the King billeted soldiers on the people.
3. To maintain the power of Parliament.

    4. Because certain chiefs were in prison.
    5. To insure re-election.
*3. What trait of the King's character is revealed?
    1. Military ability.
    2. Power of decision.
    3. Tendency to compromise.
    4. Cowardice.
    5. Legislative ability.
4. What grievance was insupportably painful to the English nation?
    1. Billeting soldiers on the people.
    2. Forced services on the army.
    3. Imprisoning their chiefs.
    4. Convoking Parliament.
    5. Collecting taxes illegally.

V

1. How was the piece of ice obtained?
    1. On a routine air flight.
    2. Through use of a helicopter.
    3. From the Eskimos.
    4. By motor-driven ice sled.
    5. By a special air mission.
2. While in the artic, Henson's motto was apparently:
    1. Necessity knows no law.
    2. Live and let live.
    3. Turn necessity to gain.
    4. Eat to live.
    5. Live to eat.
3. How many made up the exploring party?
    1. Four.
    2. Six.
    3. Eight.
    4. Fourteen.
    5. An unstated number.
4. What is this passage mainly about?
    1. The Explorers Club dinner.
    2. Peary.
    3. The discovery of the North Pole.
    4. Food likes and dislikes.
    5. Henson.

VI

***1. What does the author think about the power of the aristocracy? It is:
    1. More actively in control.
    2. Gaining power.
    3. Entirely lost.
    4. Gradually diminishing.
    5. Entrenched.
2. Who are the slowest to realize the change which is taking place?
    1. The masses.
    2. Foreign observers.
    3. The aristocrats.
    4. Government officials.
    5. Students.
*3. What other class does the author link with the nobility?
    1. The masses.
    2. Competent foreigners.
    3. The educated.
    4. The studious.
    5. The upper middle class.
4. The author compares his own views with those held by:
    1. The masses.
    2. Able and kind foreigners.
    3. The aristocracy.

4. The middle class.
5. The nobility.

VII

1. Under what conditions does man reach the highest degree of civilization?
   1. Where his wants are supplied by Nature.
   2. Where he is compelled to work for food.
   3. Where all of man's time is necessarily devoted to food-getting.
   4. Where Nature is most prodigal.
   5. Where vegetation is luxurious.
2. What does the author think about the possibilities of human development?
   1. They are very limited.
   2. Development occurs most readily in the Tropics.
   3. It is futile to expect development.
   4. It is fully arrested.
   5. There are no limits.
3. The climate believed most conducive to later human evolution is:
   1. The Tropics.
   2. The far North.
   3. The Temperate Zone.
   4. Java.
   5. Pliocene.
4. What does the author believe to be an indication of the initial stages of civilization?
   1. The amassing of a surplus over one's immediate needs.
   2. Migration from the Tropics.
   3. The beginning of the Pliocene Era.
   4. Painful, reluctant growth.
   5. Salutary geographic conditions.

VIII

1. In case the officials of a failed bank do not set a date for redeeming its notes, how is such a date established?
   1. The Minister of Finance appoints the date.
   2. The date is set by law as two months after suspension.
   3. The stockholders fix a date.
   4. The creditors fix a date after two months.
   5. There is no provision for specifying a date.
2. What is the largest amount a stockholder of a failed bank can be forced to contribute?
   1. Five per cent of his shares.
   2. An amount fixed by the directors.
   3. An amount fixed by the Minister of Finance.
   4. His shares plus their face value in cash.
   5. To the full extent of his assets.
3. What results in case the assets of a failed Canadian bank are not sufficient to redeem its outstanding notes?
   1. The notes are paid as presented as long as the assets last.
   2. All note-holders suffer a pro rata loss.
   3. The Canadian Government makes good the loss.
   4. Other Canadian banks make good the loss.
   5. The bank's directors make the loss good.
4. Why are banks required to keep a sum on deposit with the Minister of Finance?
   1. As insurance on their assets.
   2. To protect holders of their notes.
   3. To guarantee a 3 per cent rate of interest.
   4. To assist banks that may fail.
   5. To protect stockholders of the bank.

*High RW
**High RR
***High both RW and RR
(Asterisks reter only to item analysis with high school population)

Typeface and Multiple Choice Option Format

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Cronbach (1946) indicated that there are a number of response sets which influence a testee to obtain a different score from what he might obtain if the test items were presented in a different format. Most studies of such response sets have been concerned with personality characteristics and item difficulty arrangements. Relatively few reported studies have examined graphics, physical, test characteristics which might be lumped under the panoply of format, particularly typefaces, and also physical arrangement of items.

Payne (1967) reported that while there has been a substantial volume of research on typography, most of the research has been concerned with legibility, a smaller share with readability, and the remainder with specialized problems. He further noted that the reported research has compared typefaces commonly used in printing and not typefaces commonly used in typewriters. Poulton and Brown (1968) reported that apparently the only experiment comparing typefaces of teleprinters and typewriters was conducted by Fox (1963) who obtained significant differences for speed but not comprehension.

There has been considerable empirical examination of the effects of typeface variables or reading legibility. Tinker (1963) and Spache (1966) in reviews have indicated that an acceptable type format for legibility and reading speed is a 31 pica line with 2 point leading. Spache (1966) noted that in general type sizes between 9 and 12 points can be read equally fast and Tinker (1963) concluded that typefaces in common use are equally legible. The most commonly used typefaces in academic situations are elite and pica.

Insofar as type styles are concerned, Bell (1939) found that cursive script was read significantly slower than manuscript. IBM (1967) reported that proportional spacing type, in which the characters are designed to four different widths thus allowing each character a tailored width, is read 6% faster than IBM Standard Prestige elite.

Little has been reported on the effects of typeface on comprehension as indicated by multiple-choice test performance, particularly in typical college and university settings. Poulton and Brown (1968) in England used two research designs, Separate Groups, and Greco-Latin Square to examine the effects of typeface on comprehension and reading rate. The Separate Groups Design examined IBM 72 pica combined upper and lower case; IBM 72 pica lower case; Siemen's upper case; and IBM pica upper case. The Greco-Latin Square Design examined Smith-Corona elite 66 upper and lower case combined; Siemen's upper case; Smith-Corona elite 66 upper case; and Dyeline Siemen's upper case. The dependent variables were 10 open-end comprehension questions for both designs, and rate, words per minute, for the Separate Groups Design. In the Separate Groups Design, the IBM 72 pica combined upper and lower case comprehension was 13% significantly higher than the average comprehension of the three upper case faces. There were small differences in comprehension between typefaces in the Greco-Latin Design although Smith-Corona elite 66 combined upper and lower case had the highest comprehension, slightly higher than Smith-Corona pica 1 lower case.

Payne (1967) in two experiments compared the effects of two kinds of typeface, proportional spacing (IBM Modern) and elite standard spacing (IBM Prestige elite) on comprehension and speed of reading hard and easy passages of the *Davis Reading Test*. Standard spacing has all characters designed to one basic width while proportional spacing has each character designed to a tailored width. In most comparisons across both experiments non-significant superior speed and comprehension were associated with proportional spacing. One comparison was significantly in favor of proportional spacing. Adult, non-student samples were used.

There has been little reported empirical examination of physical arrangement of items. Flaugher, et al. (1966) examined four arrangements of *Scholastic Aptitude Test* items likely to have answer sheet visibility. One finding was that some verbal item arrangements produced differences in difficulty levels for items not reached by some students. Spache (1966) cited Tinker's finding that arrangements of materials such as printing successive phrases on two lines, blocking the material, vertical or columnar arrangements, thought units horizontally spaced, all produced slower reading. Little empirical evidence of the effects of physical arrangement of test items is otherwise available.

This study had two main foci. One focus was on the effects of typeface on comprehension as indicated by multiple-choice test performance. The second focus was on the effects of multiple choice item options' arrangements on comprehension. Specifically the objective was to determine the effects on performance in a multiple-choice testing situation of four typefaces, ELITE, PICA, PROPORTIONAL, and SCRIPT each with item options presented either DOWN (each option on a different line for each item) or ACROSS (each option following sequentially, continuously for each item. It was anticipated that SCRIPT-DOWN and SCRIPT-ACROSS would be associated with inferior comprehension compared with the other six treatments. It was also anticipated that the ACROSS option format would be associated with performance inferior to that associated with the DOWN option format, for all four typefaces.

PROCEDURE

Subjects (Ss) were students in an introductory special education course at the University of South Florida in May, 1969. The Ss ranged from freshmen through graduate students with median status being sophomore level. Ss were told that they were participating in a norming study of a social studies test.

Each S was randomly assigned to one of the eight treatment conditions. The Different Groups design was used as recommended by Poulton and Brown (1968) rather than a design with the same Ss receiving all treatments. The treatment conditions were ELITE-ACROSS; ELITE-DOWN; PICA-ACROSS; PICA-DOWN; PROPORTIONAL-ACROSS; PROPORTIONAL-DOWN; SCRIPT-ACROSS; and SCRIPT-DOWN. The typefaces were IBM PRESTIGE ELITE 72 Code 012, a 12 pitch weighted type; IBM COURIER PICA 72 Code 015, a 10 pitch square-serif pica type; IBM EXECUTIVE PROPORTIONAL, a type which allows each character a tailored width; and IBM SCRIPT Code 090, a 12 pitch type which simulates handwriting. The eight treatments were typed on stencils and reproduced on a conventional mimeograph machine adjusted for 20 pound paper and set for medium slow speed. Table 1 illustrates the ACROSS and DOWN multiple-choice item options format arrangements using the sample item from *Test 5 Ability to Interpret Reading Materials in the Social Studies, SRA IOWA TESTS OF EDUCATIONAL DEVELOPMENT*, Grades 9-12, Form X-4 (Science Research Associates, 1960).

TABLE 1
ACROSS and DOWN Multiple Choice Item Options Arrangements

ACROSS	Which of the following is the largest island in the West Indies? A. Haiti, B. Jamaica, C. Cuba, D. Puerto Rico
DOWN	Which of the following is the largest island in the West Indies? A. Haiti B. Jamaica C. Cuba D. Puerto Rico

Test 5 Ability to Interpret Reading Materials in the Social Studies, SRA IOWA TESTS OF EDUCATIONAL DEVELOPMENT, Grades 9-12, Form X-4 *(Test 5)* (Science Research Associates, 1960) was the experimental medium. The 53 item version of *Test 5* was used as there was not enough time for all Ss to finish the 80 item version. The ITED Manual (Science Research Associates, 1963) reports a split half reliability estimate of .90 for the 53 item version of *Test 5* for a twelfth grade sample.

A 4x2 ANOVA was conducted to determine if there were significant differences associated with typeface, option format, and interactions.

Split half and Kuder-Richardson Formula 20 reliability estimates were determined.

RESULTS

Table 2 indicates the means and N's for typeface, ACROSS vs. DOWN, and *combinations.*

TABLE 2

Means and N's for Typeface, ACROSS vs. DOWN and Combinations

	Elite	N	Pica	N	Proportional	N	Script	N	Total X	N
ACROSS	32.30	10	32.81	11	34.13	8	35.45	11	33.68	40
DOWN	38.20	10	33.45	11	36.88	8	36.82	11	36.25	40
TOTAL X	35.25	20	33.13	22	35.50	16	36.14	22		

Table 3 indicates the ANOVA for typeface, ACROSS vs. Down, and interaction.

TABLE 3

Analysis of Variance

Source of Variation	Degrees of Freedom	Sums of Squares	Mean Squares	F
Typeface	3	109.96	36.65	.69
ACROSS vs. DOWN	1	132.61	132.61	2.51
Interaction	3	84.14	28.05	.53
Within Cells	72	3802.18	52.81	
Total	79	4128.89	52.26	

As Table 3 indicates, there were no significant F's. The relatively larger F computed for the ACROSS vs. DOWN difference, while not significant, reflects the difference in means between ACROSS and DOWN indicated in Table 2 which held in the ACROSS vs. DOWN comparisons for each of the four typefaces as well as when combined across the four typefaces. It appears that the arrangement of multiple-choice item options may affect a testee's performance probably not substantially but conceivably enough to justify further investigation. This finding supports the speculation that other format factors may also influence multiple-choice test performance. If this is the case it may be further speculated that multiple-choice test performance may well be substantially influenced by format variables and that a considerable portion of multiple-choice test variance may be spuriously associated with such format variables rather than with the desired knowledge and/or ability. While this situation is undesirable from a theoretical view, whether or not it is important practically depends on how the format variables interact with testees. If the format variables operate randomly the importance of format variables is minimal. However if the format variables operate differentially with different testees, their test scores may be an inaccurate reflection of their real knowledge and/or ability. Further research to determine the effects of format variables in general and the differential effects of format variables in particular is suggested.

The highest typeface performance was associated with ELITE-DOWN, with ELITE-PROPORTIONAL, and ELITE-SCRIPT next. The effect of ELITE typeface washed out however when it was combined with ELITE-ACROSS.

The authors' hypothesis that SCRIPT would be associated with the lowest performance was not substantiated and in fact SCRIPT produced the highest performance in the ACROSS item options arrangement although none of these means differed much. The authors' second hypothesis that inferior performance would be associated with the ACROSS item options arrangement was not supported statistically although the DOWN means were higher in every comparison.

The reliability of *Test 5* was estimated so that if *Test 5* was found to be reliable the experimental results could better be attributed to the independent variables. If *Test 5* was found to be unreliable the authors would be unable to determine whether the lack of significant differences was due to the weakness of the independent variables or if there may have been effects which were masked by the unreliability of *Test 5*.

Since N's were small for the ACROSS and DOWN groups for each typeface and since there were no significant differences between ACROSS and DOWN groups, the ACROSS and DOWN Ss were combined into one group for the reliability estimates for each of the four typefaces.

Table 4 indicates odd-even split half and Kuder-Richardson reliability estimates, and N's for each typeface, with the ACROSS and DOWN groups combined.

TABLE 4

N's and Split Half and Kuder-Richardson Reliability Estimates with ACROSS and DOWN Combined for Each Typeface

	N	Split Half	Kuder-Richardson
ELITE	20	.88	.87
PICA	22	.82	.84
PROPORTIONAL	16	.47	.56
SCRIPT	22	.91	.92

The high reliabilities associated with the ELITE, PICA, and SCRIPT typefaces reinforce the conclusion that insofar as comprehension is concerned the effects of commonly used typefaces are limited, small, that the typeface used probably does not substantially affect a testee's performance in a conventional multiple-choice testing situation. This is consistent with the findings of Payne (1967) who obtained non-significant results in most comparisons and Poulton and Brown (1968) who in some comparisons did get significant but small differences. The low reliability found for PROPORTIONAL may reflect the relatively small N which consequently might be non-representative, and also the small variance which obtained in the DOWN condition.

CONCLUSIONS

The following conclusions appear appropriate:

1. Typeface does not substantially affect performance in conventional multiple-choice testing.
2. Although ACROSS vs. DOWN multiple-choice item option format did not significantly influence test performance it was speculated that ACROSS vs. DOWN in combination with other format variables might significantly influence multiple-choice test performance, and further research on the physical arrangement of multiple-choice test items is recommended.

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An Investigation of the Effectiveness of a Special Program Upon the Development of Visual Perception for Word Recognition of Culturally Disadvantaged First Grade Students*

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BACKGROUND OF THE PROBLEM

Educators and psychologists indicate there is need for research in the field of co-ordinating methods and materials compatible to the developmental levels of children. Evidence reveals that the majority of middle-class children learn amazingly well in the present school system. Furthermore, evidence substantiates that culturally disadvantaged children are frequently behind their peers. (3) The methods and materials that are useful to the average child do not seem to help the culturally disadvantaged child acquire the vital communication and computation skills that are necessary for adequate achievement in school. This range in the ability to achieve is a source of frustration to the teacher as well as to the culturally disadvantaged child. Consequently, the teacher and the child are ready to admit defeat. (1)

Many reading problems of the culturally disadvantaged child are likely to be related most directly to the very meager experience in visual perceptual abilities. (3) Unfortunately, many culturally disadvantaged children exhibit an impediment in their visual perceptual development. A child with an impediment in this particular area is handicapped in recognizing objects and their relationship one to the other. This child will have difficulty in academic learning no matter how intelligent he may be. (4)

There is also support for the consideration that children from low socio-economic environments will achieve at an inferior level in reading and that culturally disadvantaged children who are handicapped in visual perception are frequently retarded in language development.

SUMMARY OF REVIEWED LITERATURE

Based on the significant research results reported for visual discrimination as a predictor of reading success, and the established deficiency of the culturally disadvantaged pupil in visual perceptual abilities, the supplementation of the reading readiness program with additional visual perceptual training should be an effective method

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in developing word recognition and increasing subsequent reading achievement, and thereby meet the needs of the culturally disadvantaged pupil. A demand exists for supplementary materials to meet the needs of the culturally disadvantaged child who is entering school. The use of visual perceptual training materials as a supplement to the readiness materials may provide effective training for the child with this difficulty in visual perception.

STATEMENT OF THE PROBLEM

The purpose of this study was to determine the effectiveness of visual perceptual training upon word recognition and subsequent reading achievement of the culturally disadvantaged pupil who is in the first grade.

HYPOTHESIS

The hypothesis tested was that no difference would be revealed in the level of word recognition between the Experimental Groups consisting of pupils receiving the Frostig Program for the Development of Visual Perception and the Control Groups consisting of pupils receiving the traditional orthography.

No difference would exist in the level of reading achievement between the Control Groups and the Experimental Groups of pupils.

No significant difference would exist in the progress of reading achievement between the Control Groups and the Experimental Groups.

SUBJECTS AND PROCEDURES

This study conducted in the school year 1967-1968, included forty-eight pupils in two sections of the first grade of the East Livingston Elementary School of Albany, Louisiana.

No effort was made to structure or fix the procedure for class enrollment. Any pupil eligible for the first grade was permitted to enter school. Any chance of skewing of the population of subjects was negated through a careful randomization into the experimental groups. The pupils were from families with an annual income of $3,000.00 or less, and of parents having eight years or less of schooling.

Aside from the experimental training techniques that were added to the regular program of the Experimental Groups, the basic curriculum remained the same for all the pupils. The teachers employed the "Look and Say" method in their reading instruction; no attempt was made to alter or standardize the teacher's methods of motivation and presentation. It was not the purpose of this study to include age or sex factors, there being no matching of subjects.

The investigator employed two treatment groups: The Experimental Groups received the Frostig Program for the Development of Visual Perception for a period of twelve weeks in addition to the the regular basal reading program. The Control Groups received the basal reading program as outlined in the teacher's manual of the basal series.

At the end of twelve weeks, the pupils were administered the Gates Primary Reading Test Form I. The pupils were administered Form II of the Gates Primary Reading Test at the end of eighteen weeks, and Form III of the Gates Primary Reading Test at the end of twenty-four weeks.

RESULTS

The data were treated by an analysis of covariance (5) to test the significance of the differences between the means of the Control Groups and the Means of the Experimental Groups. Where the analysis indicated statistically significant differences between the means, the data were examined with the use of the Fisher Test for significance.

An analysis of the mean differences between the Control Group and the Experimental Group in terms of deviation intelligence quotients is presented in Table I.

No significant difference existed between the means of the two groups in deviation intelligence quotients as measured by the Peabody Picture Vocabulary Test.

TABLE 1

Summary of the Mean Deviation I.Q.'s of the Experimental Group and the Control Group

Group	DF	Mean	SD	F
Experimental	24	63.4	16.66	3.12
Control	24	71.3	14.31	

An analysis of variance of the five sub-tests of the *Frostig Developmental Test of Visual Perception* of the Experimental Group and the Control Group indicated no significant difference existed between the means of the two groups as measured by the Frostig Developmental Test of Visual Perception.

The findings of this study, as they are related to the hypothesis concerning the effect of visual perceptual training upon word recognition, are found in Table 2.

TABLE 2

Analysis of Variance of the Results of the Frostig Developmental Test of Visual Perception of the Experimental Groups Versus the Control Groups

Test	Experimental	Control	F
I	56.25	56.00	.03
II	48.12	49.00	1.78
III	61.00	62.00	.62
IV	42.12	44.87	1.82
V	57.87	58.75	1.15

The findings of this study, as they are related to the hypothesis concerning the effect of visual perceptual training upon word recognition, are found in Table 3.

TABLE 3

Analysis of Covariance Between Means of Test I, II, and Test III of the Experimental Group and the Control Group on the Gates Word Recognition Test with I.Q. Constant

Test	Experimental	Control	F
I.Q.	63.4	71.3	3.12
I	78.99	79.135	4.173*
II	80.294	79.539	9.51 *
III	80.048	80.0447	1.63

* Significant at the .05 level of confidence

The results of the between-groups analysis indicate that the mean difference for word recognition was not statistically significant on Test I and Test III: on Test II the mean difference was significant at the .05 level of confidence.

The hypothesis that no difference would be revealed in the level of word recognition between the Experimental Group consisting of pupils receiving the Frostig Program for the Development of Visual Perception and the Control Group consisting of pupils receiving the traditional orthography was partially supported. The significant mean difference shown in the test results for Test II reflect a change in the Experimental Group beyond the .05 level. At the end of twenty-four weeks, however, as indicated by the third testing, the significance had disappeared.

Only partial support was yielded for the hypothesis that no significant differences would exist in the total reading scores of the Control Group and the Experimental Group. The difference between the means of the two groups on Test II was significant beyond the .05 level. Analysis of these means at the end of twenty-four weeks, Test III, failed to indicate any significant difference.

The last hypothesis was that there would be no difference in the progress of reading achievement between the Control Group and the Experimental Group in either word recognition or total reading score.

CONCLUSIONS

1. Supplementation of the basal reading program with the Frostig Program for the Development of Visual Perception did not appear to yield a significant difference in the means on word recognition of the Experimental Groups, who received this training, and the Control Groups who did not receive supplementary materials, as measured by the Gates Primary Reading Tests.

2. Supplementation of the basal reading program with the Frostig Program for the Development of Visual Perception for the Experi-

mental Group indicated a significant difference in total reading score above the Control Group at the eighteen-week testing period, however, as with word recognition, this difference had disappeared by the time the twenty-four week test was administered.

3. Supplementation of the basal reading program with the Frostig Program for the Development of Visual Perception for the Experimental Group indicated no difference in progress of reading achievement, as both the Experimental Group and the Control Group showed equal gains on both total reading score and word recognition.

This study would indicate that the introduction of this particular type of program is not of lasting value. The conjecture that the extension of the regression lines and the angle of the regression lines for the twenty-four week testing program, if continued, would show that the Control Group would actually surpass the Experimental Group. This could indicate that we would be introducing habits in this program that would cause a continual set-back for the culturally disadvantaged pupil.

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Fixed- and Variable-Ratio Reinforcement of Reading Performance

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Reinforcement studies of infrahuman species continue to provide consistent information concerning the behavioral effects of different reinforcement schedules on infrahuman species. Reinforcement studies of the human species, however, provide less consistent, and often conflicting, information concerning the behavioral products of human reinforcement scheduling. Furthermore, almost all human studies of reinforcement scheduling have been conducted on either abnormal subjects, subjects in laboratory situations, or subjects isolated from one another. These latter types of studies appear to have limited generalizability to human subjects in the so-called real world.

PURPOSE OF STUDY

The present classroom study of the effects of fixed-ratio and variable-ratio reinforcement on reading performance supports the contention that many studies of reinforcement scheduling have limited generalizability to group situations. In the study, the response rate of average and below-average subjects seemed to be affected to a large degree by something other than the various reinforcement contingencies used to reward the subjects. In fact the rate of response of average and below-average subjects appeared to be affected adversely by, so to speak, the competitive environment—one in which, under ratio reinforcement, above average subjects earned many more rewards than their less capable classmates. (1) What the precise effect the subjects' knowledge of inequitable reinforcement had on the subjects' responsiveness is, of course, difficult to determine. Nevertheless, the present study of reinforcement scheduling has implications for those of us concerned with classroom reading instruction and learning as well as with reading behavior research from which we wish to make generalizations to classroom or other group learning situations.

APPLICATION OF READING REINFORCEMENT

In the classroom, conscious application of reinforcement principles has been limited. While the old saying "Learning is its own reward" may apply to certain children in the classroom, the question remains as to whether the saying applies to *all, some,* or *most* children learning to read, for example, in programmed materials. Other questions also arise. What patterns of reward are as reinforcing as, or more reinforcing than "learning" itself? What rates of accurate responding are produced when different reinforcement patterns are used with different groups of students? Finally, and perhaps most important of all for classroom learning today, what is the effect of inequitable reinforcement on students, especially on "average" and "below-average" students who are "losing the game," so to speak, to their above-average classmates?

Since the advent of programmed reading texts, it has been noted that many students have been able to learn basic word recognition skills on their own at their own speed in linearly programmed material. In most programmed reading texts thus far published, learning steps are programmed in such a way that even the slowest students in the class have little difficulty moving from one step to the next. Of course, continuous and accurate responding to frame after frame is necessary to reach subsequent objectives in the programmed material.

The question as to whether or not the instructional steps in the linearly programmed texts are sequenced correctly or are the most parsimonious for the individual learner is a moot point. Linear type reading programs continue to be constructed, published, used for a time, revised and then used again. Meanwhile ever-increasing numbers of pupils and teachers depend heavily upon linearly programmed reading material to develop reading skills. Therefore, since the speed and accuracy with which many pupils in the classroom progress through programmed steps determines how soon various reading skill objectives are met, knowledge of easily manipulated variables (e.g. reinforcement contingencies) which affect the rate of accurate responding in programmed material would be of significant value to teachers of reading, researchers, and developers of programmed reading materials.

DESIGN OF STUDY

The study described herein, while investigating the effects of fixed-ratio and variable-ratio reinforcement schedules on the reading performance of second grade pupils, was limited to an investigation of the effects of a low fixed-ratio, a high fixed-ratio, a high variable-ratio, and a no-reinforcement contingency schedule.

The subjects, fifty boys and fifty girls from four second-grade classrooms of one elementary school, responded in response books to programmed reading texts during a five-week period. On the basis of four unrewarded sessions during the first week of the study, the subjects were divided into three reading levels, above average (AA), average (A), and below average (BA) and were randomly assigned to the no reinforcement group (Group A), the low fixed-ratio group (Group B), the high fixed-ratio group (Group C), and the high variable-ratio group (Group D). During the remaining four weeks of the study the subjects in Group A received no reinforcement, except the possible reinforcing effects of learning the right answer after responding; the subjects in Group B received reinforcement after reading and responding to material which covered a span of 300 words in the programmed text; the subjects in Group C received reinforcement after reading and responding to material which covered a span of 700 words in the programmed test; and the subjects in Group D received reinforcement at random after reading and responding to material which covered a span of 700 words "on the average" in the programmed text.

REINFORCEMENT SYSTEM

Reinforcement consisted of red foil stars which were exchanged at the end of each sixty-minute session for pennies which, in turn, were either kept or inserted in a Model 60 Midwest Vending Company dispenser containing a 2:1 ratio of multi-colored candy coated peanuts and attractive charms. The independent variable in the study consisted of the rewards received as a function of either the no reinforcement, the low fixed-ratio, the high fixed-ratio, or the variable-ratio contingency. The dependent variables, on the other hand, were the weekly means and grand means of responding by students at the various reading levels within the four treatment groups.

ANALYSIS OF DATA

Univariate analysis of variance revealed that the week one means for each of the three reading levels were not statistically equal, as designed. A further analysis of variance for one-way design showed that the week one means for each of the four treatment groups were statistically equal, again as designed. Significance in both instances was at the .05 level.

While analysis of variance revealed no statistical difference between the grand means of groups within levels, or between the grand means of groups, an analysis of absolute differences revealed a highly significant trend. Above-average readers responded as one might have expected, responding from most to least frequently in (1) the low fixed-ratio group (Group B), (2) the high fixed ratio group (Group C), (3) and the high variable-ratio group (Group D), and (4) the no reinforcement group (Group A), respectively.

But average and below average subjects seemed to respond as much to "losing the game" as to the reinforcement contingencies. Average subjects, for example, favored (1) the reinforcement group in which neither the above-average, average, nor below-average subjects received rewards for their reading performance (Group A), (2) the low fixed-ratio group (Group B), (3) the variable-ratio group (Group D), and (4) the high fixed-ratio group (Group C), respectively. Similarly, below-average subjects also favored the group in which none of the subjects in the group received rewards for their reading performance. Below-average subjects favored (1) the no reinforcement group (Group A), (2) the high fixed-ratio group (Group C), (3) the low fixed-ratio group (Group B), and (4) the variable-ratio group (Group D), respectively. Also, a multivariate analysis of variance tests indicated that the effect of ratio reinforcement on above-average, average, and below-average subjects was the same regardless of sex.

MEANS USED IN MULTIVARIATE ANALYSIS OF VARIANCE

		Mean Weekly Rate
1. Source A (sex)	Male	246.618
	Female	250,303
2. Source B (levels)	Level AA	309.154
	Level A	252.156
	Level BA	184.071
3. Source AB	Male, AA	327.542
	Male, A	233.208
	Male, BA	179.104
	Female AA	290.767
	Female A	271.104
	Female BA	189.037
4. Source C (groups)	Group A	257.039
	Group B	266.983
	Group C	242.958
	Group D	226.861
5. Source AC	Male, Group A	251.278
	Male, Group B	263.417
	Male, Group C	245.889
	Male, Group D	225.889
	Female, Group A	262.800
	Female, Group B	270.550
	Female, Group C	240.028
	Female, Group D	227.833
6. Source BC	Level AA, Group A	281.167
	Level AA, Group B	365.450
	Level AA, Group C	303.000
	Level AA, Group D	287.000
	Level A Group A	278.917
	Level A, Group B	253.500
	Level A, Group C	236.625
	Level A, Group D	239.583
	Level BA, Group A	211.033
	Level BA, Group B	182.000
	Level BA, Group C	189.250
	Level BA, Group D	154.000

7. Source ABC	Male, AA, Group A	279.667
	Male, AA, Group B	383.500
	Male, AA, Group C	329.000
	Male, AA, Group D	318.000
	Male, A, Group A	261.500
	Male, A, Group B	222.000
	Male, A, Group 3	220.000
	Male, A, Group D	229.333
	Male, BA, Group A	212.667
	Male, BA, Group B	184.750
	Male, BA, Group C	130.333
	Male, BA, Group D	188.667
	Female, AA, Group A	282.667
	Female, AA, Group B	347.400
	Female, AA, Group C	277.000
	Female, AA, Group D	256.000
	Female, A, Group A	296.333
	Female, A, Group B	285.000
	Female, A, Group C	253.250
	Female, A, Group D	249.833
	Female, BA, Group A	209.400
	Female, BA, Group B	179.250
	Female, BA, Group C	189.833
	Female, BA, Group D	177.667

DISCUSSION

Analysis of the above mean weekly values, then, reveals that above-average readers responded as one would expect. Above-average readers in Group A, the no reinforcement group, produced the lowest overall response rate which seems to indicate that above average readers in a *classroom* situation respond better with some type of reinforcement than they do with no reinforcement. Also, that the low fixed-ratio group (Group B) rate for above-average readers is higher than the high fixed-ratio group (Group C) rate for above-average readers appears to show that above-average readers in a classroom situation will respond better with frequent reinforcement than they will with infrequent reinforcement. The high variable-ratio group (Group D) treatment produced for above average readers the next to lowest response rate. This relatively low response rate may indicate that above average readers prefer to know at what point they are to be rewarded or perhaps prefer consistency in receiving awards. On the other hand, since below average readers responded least well to variable-ratio reinforcement (Group D), it would seem that both the inconsistency of reinforcement and the knowledge of "losing" affected the response rate. The difference between the response rate of below-average readers in Group B and Group C, in favor of Group C, the high fixed-ratio reinforcement group, may have been caused because of the subjects' more acute awareness of "losing" when in the lower ratio reinforcement group, Group B.

IMPLICATIONS OF STUDY

Other hypotheses can be derived from an analysis of the data in the above table, but the present study indicates the importance of (1) utilizing classroom or group situations and (2) analyzing the response patterns of a cross-section of subjects, when studying the effects of schedules of reinforcement on reading performance. While schedule of reinforcement studies of human subjects in laboratory situations reveals response patterns somewhat similar to the response patterns produced in infrahuman subjects, the dispensing of reinforcement within a classroom situation produces response patterns which cannot be explained from either infrahuman studies or human studies conducted in laboratory situations in which subjects are isolated from one another. Furthermore, while ratio reinforcement and especially low-fixed ratio reinforcement may increase the rate of responding, and perhaps learning, of faster students in a class, it may also have the effect of discouraging the slower students in the class who recognize their ability to gain as much reinforcement as their faster classmates.

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The Convergence Technique for Research in the Social Sciences: An Application In the Study of Reading[*]

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In October of 1967, staff members of the Bureau of Research and the Bureau of Education for the Handicapped undertook an informal study of recent research findings in order to identify major needs in reading research and to seek strategies for aligning future investments with those needs. This informal study examined the magnitude of OE expenditures on reading research; knowledge about reading and reading instruction generated in the First Grade Reading Studies (1), Project Literacy (9, 10), Chall's (3) report on reading instruction research; and the importance of reading achievement as displayed in Passow's (11) and Dailey's (4) studies of reading in specific school systems. The OE staff members involved, corroborated by advice from several consultants, concluded that a new program of research on reading was needed and that some of its desirable features were clear: its initial focus should be upon basic research and theory-building rather than upon instructional approaches; it should encourage active collaboration among many scientific disciplines; its component projects should be clearly and logically related to each other so that they could have cumulative impact.

Reading research has been characterized as lacking in that "cumulative continuity that has characterized all sound scientific research." (5) To avoid another piecemeal attack on the problem, the OE staff thought that a systematic research planning technique was essential. Several were examined including Program Planning and Budgeting System (PPBS), networking systems such as Program Evaluation and Review Technique (PERT). They also examined Platt's (12) "Strong Inference" in an effort to determine the necessary ingredients for a productive research program.

After considerable discussion, it was decided to employ the Convergence Technique, which was developed by Louis M. Carrese and Carl G. Baker (2) specifically for the planning of research programs conducted by the National Cancer Institute. Although the technique had not been applied to research problems outside the biomedical sciences, there were no apparent limits to its generalizability. Conversations with Louis Carrese reinforced the belief that the Convergence Technique warranted a trial in educational research and that it could make a real contribution to the study of reading.

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THE CONVERGENCE TECHNIQUE

The Convergence Technique is a formalized system for integrating research efforts into solution-oriented programs. The developers of the Convergence Technique reasoned that because research is a process of exposing the inherent order—or logic—of natural phenomena, then the logic of the phenomenon under study is the best guide for sequencing and specifying the research needed to get a functional understanding of it. Therefore, research conducted according to a plan which very closely approximates the logic of the phenomenon under study will progressively reduce the number of unanswered questions, allowing funds and talents to *CONVERGE* upon the remaining questions. This is the basic concept of the Convergence Technique.

It is difficult to characterize the Convergence Technique in a word or phrase without distorting its purpose and function. As will be seen in the discussion which follows, the technique (1) facilitates program planning, (2) performs an information holding and up-dating function, (3) facilitates program management decision-making, and (4) has characteristics of a self-correcting mechanism.

An application of the Convergence Technique consists of steps which are

(1) A planning session which initially delineates
    (a) The final goal to be achieved by the program;
    (b) The intermediate goals necessary for the achievement of that final goal;
    (c) The sequence in which those intermediate goals logically lead to the final goal;
    (d) The research needed to achieve each intermediate goal;
    (e) The criteria which must be met in order to conclude that each intermediate goal has been achieved.
(2) Construction of a chart which displays the five elements above.
(3) The use of the Convergence Chart in program management for decisions on
    (a) Specific research projects to be undertaken;
    (b) Movement to the next phase.
(4) Updating and possible revision of the Convergence Chart on the basis of information generated as the research program progresses. (7)

Organizing Principles of the Technique

Several organizing principles have been found useful in explicating the Convergence Technique. These include the primacy of the program goal, the identification and sequencing of sub-objectives necessary for attainment of the program goal, the role of "criteria" in program planning *and* management, the nature and operation of a planning team, and the Convergence Chart. Each of these will be treated in turn.

The Program Goal

The specification of a program goal is the most powerful determiner of the nature of a research program. In formulating the plan for the Special Virus Leukemia Program, National Cancer Institute planners could have chosen either of the following as their goal: "Develop techniques for early diagnosis of leukemia," or "Routine and widespread use of preventive and/or control measures for leukemia." The first of these would require a research concentration on identification of initial symptoms, the second on causes, and cures, and preventatives. A final goal should indicate the kinds of research needed; or as Carrese and Baker state, it must "serve as the basis for action." (2, p. B-429) Goals must neither be diffuse (e.g., to improve mankind's existence) nor lacking in perspective (e.g., to test some single hypothesis). The language used for stating a goal should be as concrete as possible because abstraction in language tends to increase ambiguity and often provides elegant though unintentional camouflage for empty concepts.

Identification and Sequencing of Sub-Objectives

Details of a research program are provided by identifying those things that must be accomplished enroute to the program goal. Once a goal is stated, its logic or inherent structure must be specified. The elements of this structure comprise the program's sub-objectives. The sequence in which they must be accomplished provides the outline of the program plan.

Role of "Criteria" in Program Planning and Management

In some programmatic efforts the completion of a sub-activity automatically signals the achievement of a sub-objective. For example, if one such activity is the delivery of ten tons of steel to a specified place no additional criteria are needed. When unknowns are involved specified criteria are needed. The mere completion of a research project focused on an unknown in a program is not sufficient. That project may produce information contrary to the logic of the program. If one intermediate goal is to develop a test, then criteria for acceptable validity and reliability of the test and perhaps for ease of administration and scoring would be specified. In a convergence application criteria are established for each sub-objective.

Every research project undertaken in the overall program meets two kinds of standards: standards for scientific rigor AND standards for relevance to the program's goals. Because the criteria for goal attainment provide the program relevance standards, they aid in assessing progress, in determining what information is needed, and in making program modifications.

The Planning Team

Obviously, the ability of the people who perform the activities outlined above has a great deal to do with the plan's ultimate accuracy in approximating the real order of the target phenomenon. Because experience indicates that a group larger than five or six may be unwieldy, each team member must represent a distinct, needed specialty with as little overlap as possible. The basic team is composed of three members:

> " (a) one person who has a general, comprehensive knowledge of the broad area of research and major scientific disciplines in which the substance of the program to be planned is included (e.g., cancer, virology, nuclear physics, etc.); (b) one person with specialized knowledge of an experience in the conduct of research in the particular area to be planned . . . and (c) one person (usually sufficient) with general systems analysis knowledge and direct experience in the use of the planning technique." (2, p. B-424)

This core membership may be enlarged by adding other specialists as needed, up to the practical limit of 5 or 6.

The Planning Sessions

The planning team must be prepared to devote a large, uninterrupted block of time to forging the plan. Every idea presented is pursued to one of three logical end points: (1) the concept is relevant to intermediate or final goals; (2) it is not relevant; or (3) with specific modifications, it would become relevant. This process, which is both exhaustive and exhausting, should ideally continue until the logic system is very highly developed. The planning team, however, does not work in total isolation. It should have prearranged access to library materials and consultants. Review of interim drafts of the logic system can be performed by other experts while the planning team moves ahead.

The Convergence Chart

The planning team obviously cannot keep all the relevant details in mind throughout a 4- to 8-week session. Tape recordings and photos of blackboard notes are good devices for short-term storage, but a Convergence Chart is constructed as the continuously developing model of the program to be conducted.

The phrase "continuously developing model of the program" above has meaning that should be made explicit. The Convergence Chart evolves during the planning session through the deliberations of the team members and inputs solicited from consultants to that team. Before the research program is implemented the Convergence Chart is submitted to rigorous critique on the part of specialists from related disciplines. The chart may be modified as a result of those critiques. Finally, as the program progresses, newly generated information may challenge the logic on which the work is based. In such an instance, and it has occurred in the biomedical applications, the chart must be modified to take this new information into account.

Convergence Charts have several elements or arrays, to use Carrese's terminology. The *linear array* includes those activities that are absolutely necessary for the attainment of intermediate and final goals. A *concurrent array* shows research which promises to optimize performance in the linear array. Finally, a chart displays a *supplementary array* composed of activities with a different logical structure which if successful would cause major changes in the linear array.

APPLICATION OF THE CONVERGENCE TECHNIQUE TO READING

The decision to apply the Convergence Technique to a program of research on reading led to an OE contract with Phi Delta Kappa in June, 1968. In the execution of that contract two planning sessions and a Reading Definition Conference have been held.

The first planning session involved five persons selected to fill roles of (1) a systems analyst, (2) reading specialist, (3) generalist in educational research, (4) psycholinguist, and (5) representative of the major funding agency for the proposed program. A sixth team member was originally included, a neurophysiologist, but illness made his participation impossible.

A conscious effort was made to find persons who not only represented a specific discipline, but who displayed a concurrent interest in reading. As a result the team had more than one "expert" on reading. Each of these persons had a different view of what reading is. The remaining members heard divergent statements about the nature of reading. In the absence of hard data to support one viewpoint or another these remaining Planning Team members tried to become knowledgeable about reading, an activity that took time from the planning of a Convergence Chart. (These and some other difficulties could be overcome by holding a preliminary conference involving more persons than are necessary for a Planning Team. The observation of persons and interactions in that presession could give helpful information not typically available now.)

Carrese, the originator of the technique, indicates that a Convergence Technique application can fail for either of two reasons:

(1) The field is not developed to a state at which a comprehensive logical structure is visible.

(2) The makeup of the planning team is such that it is not capable of merging existing knowledge.

The application of the technique to reading encountered problems in both of those areas. Because of these difficulties the first team did not produce a Convergence Chart. Instead it produced a block diagram of a possible Convergence Chart, suggestions for a tentative definition of reading, a hypothetical model, and specifications for a literature search, evaluation, and synthesis.

After this team disbanded, the Project Director followed their suggestions and developed a tentative definition of reading (6) which examined the term from a variety of usage and definitional points of view. Initial reaction to this effort resulted in an extension of the Contract for the purposes of (1) systematically critiquing the tentative definition statement and (2) conducting a second planning session.

The tentative definition was sent to a list of 150 specialists in reading identified by the International Reading Association, the U. S. Office of Education, and the Project Director. All of these individuals were invited to critique the statement. Fifty of them were offered an honorarium for this critique.

Responses from these specialists and the definition statement itself made up the input to a Reading Definition Conference. Participants in that session were six outstanding researchers from the field of reading, a representative of the Office of Education, and the Project Director. The specialists involved commended the effort to develop a comprehensive definition but recognized in it much that is hypothetical. They expressed a reluctance toward research program planning on such a hypothetical basis and recommended a reduction in scope of the definition task from "reading" to "reading behaviors" and specified a definition for the latter. That definition statement will be in the project final report.

A second planning team was then constituted. This time an effort was made to select only one reading specialist. This second team met for five weeks in the Fall of 1969. That team has produced a Convergence Chart to achieve the goal: 100 per cent of all people (not in permanent care institutions) over 10 years of age can complete 90 per cent of a set of tasks which exemplify reading behaviors. That goal and the program plan are presented below.

RESEARCH AND DEVELOPMENT FOR READING

The field of reading has two assets on which this program is based. First, the literature on the field presents models of the reading process, the process of learning to read, and of reading instruction. Some of these models have been subjected to empirical tests and have been at least partially confirmed. Second, large numbers of children learn to read as they move through schools.

The R & D for Reading Program assumes that by becoming more systematic in model development *and* in instructional system development functional reading competence can be attained by all. The

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Research & Development for Reading

Phase Product Block Diagram

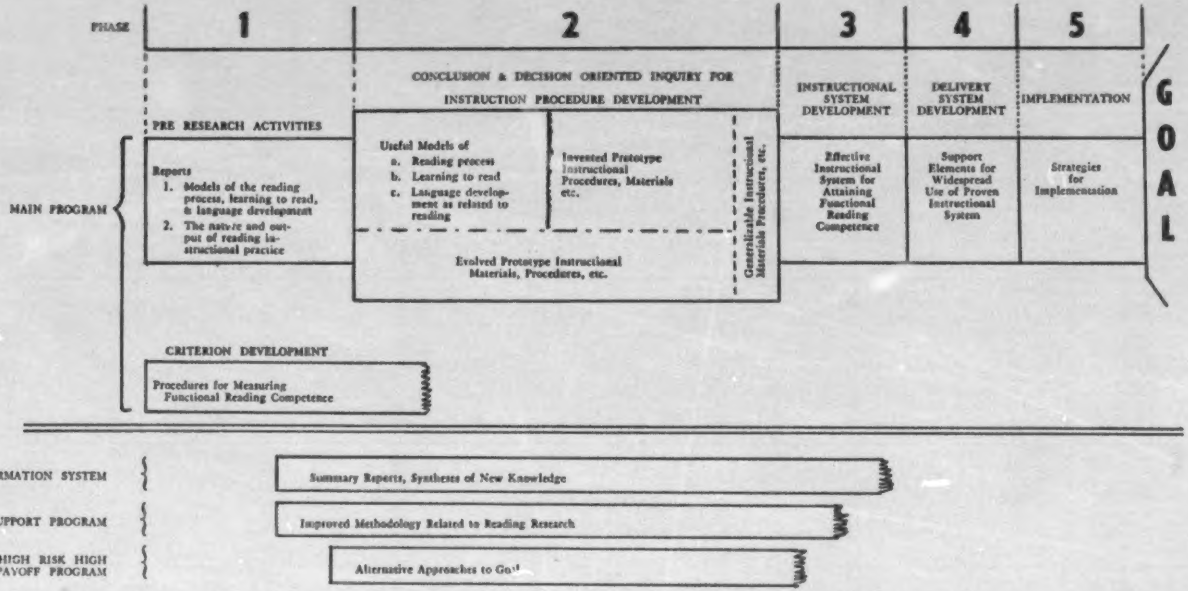
PHASE
1
2
3
4
5
CONCLUSION & DECISION ORIENTED INQUIRY FOR INSTRUCTION PROCEDURE DEVELOPMENT
INSTRUCTIONAL SYSTEM DEVELOPMENT
DELIVERY SYSTEM DEVELOPMENT
IMPLEMENTATION
GOAL
PRE RESEARCH ACTIVITIES
MAIN PROGRAM
Reports
1. Models of the reading process, learning to read, & language development
2. The nature and output of reading instructional practice
Useful Models of
a. Reading process
b. Learning to read
c. Language development as related to reading
Invented Prototype Instructional Procedures, Materials etc.
Generalizable Instructional Materials Procedures, etc.
Evolved Prototype Instructional Materials, Procedures, etc.
Effective Instructional System for Attaining Functional Reading Competence
Support Elements for Widespread Use of Proven Instructional System
Strategies for Implementation
CRITERION DEVELOPMENT
Procedures for Measuring Functional Reading Competence
INFORMATION SYSTEM
Summary Reports, Syntheses of New Knowledge
SUPPORT PROGRAM
Improved Methodology Related to Reading Research
HIGH RISK HIGH PAYOFF PROGRAM
Alternative Approaches to Goal

FIGURE 1

combination of the program plan presented on these pages and continued application of the Convergence Technique management procedures should make work on model and instructional system development more systematic, efficient, and cummulative than it has been in the past.

The R & D for Reading Program involves:

(1) the identification of existing models of the reading, learning to read, and reading instruction processes;

(2) further refinement, development *and* empirical confirmation of existing models of the reading and learning to read processes to the point at which they facilitate accurate explanation *and* prediction of reading behaviors and thus become useful bases for engineering instructional materials and procedures;

(3) concurrent and systematic adaptation of instructional programs by experimentation designed to reduce the discrepancy between reading instruction objectives and outcomes;

(4) the conduct of independent confirmations to assess the communicability, effectiveness, and robustness of prototype materials, procedures equipment, etc.

(5) the design and testing of an instructional system which incorporates the effective items (referred to in (4) above) into an instructional system capable of achieving the program objective of functional reading competence;

(6) the design and testing of a delivery system, the supportive materials, procedures, etc., necessary to ensure effective use of a proven instructional system; and

(7) design of implementation strategies.

A block diagram of this program is presented in Figure 1 showing the products to be achieved in each phase of the programatic effort.

Functional Reading Competence: The Program Goal

Successful performance in reading tasks deemed an intregral part of adult life is the ultimate objective of this program. As such, the program calls for the delineation of those tasks and their prediction through performances of ten year olds. Obviously that functional reading competence is multi-dimensional. *If* it were only three dimensional, it could be displayed as the surface in Figure 2.

Phase I of the Program: Goal Specification and Knowledge Synthesis

As indicated above, the program goal is the attainment of a level of functional reading competence on the part of ten year olds, a level that leads to effective performance of adult reading tasks. That goal is indeterminate at the outset of the program for at least two reasons. First, the composite of adult reading tasks required for this culture has not been specified. Some work has been attempted to set the minimum reading competence for survival, and much has been said about the other extreme, the "perfect reader." The program goal has

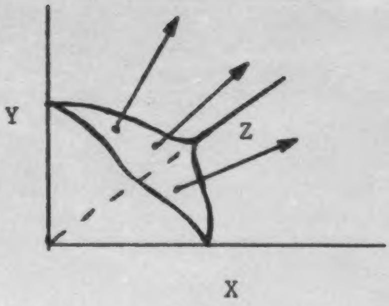

Figure 2

The RDP Program goal is to get all 10 year olds (except those in permanent care institutions) beyond the surface labeled XYZ.

The RDR criterion instrument will consist of reading tasks that define that surface.

a standard somewhere between these extremes, a standard that must be set after weighting the economic, political, personal, and social factors related to and/or affected by reading competence. Setting that standard involves value judgments, an activity that must be broadly based. Once the standard of functional reading competence has been set, instruments for assessing its attainment must be developed. This latter activity is seen as a part of Phase II.

The activities related to goal and standard specification in Phase I along with a description of anticipated products are displayed in the bottom row of boxes in Figure 3.

Concurrent with standard specification activities, the program plan calls for two literature search and synthesis efforts. The first of these concentrates on the nature of three phenomena, the reading process, the learning to read process, and language development related to reading. The goal of this search is a delineation of the models, the representations of these phenomena that have been developed. This effort is included in the program on the assumptions that carefully developed and adequately tested models of phenomena facilitate the understanding of those phenomena and that understanding of the target phenomenon is a requisite in improving its instruction. This literature search, as shown in the criteria statement for Product #1 in Figure 3, will specify the research efforts for further model development in Phase II.

The second literature search will focus on instructional practice. Its product is a report or reports which: (a) synthesize what is known about the degree to which functional reading competence is achieved; (b) describe current instructional reading practices; and (c) describe current practices for training teachers for these instructional practices.

The program plan calls for these two activities to be completed by June 30, 1971. This type of literature synthesis is not terminated at that point, however. The program plan calls for its continuation through an information system throughout the programatic effort.

Phase II of the Program: Development of Instructional System Components

Two major activities structure Phase II of the program, the development of instrumentation for assessing the attainment of functional reading competence and the development of components for the instructional system that have been proven effective. Once valid instrumentation exists, surveys will be conducted to determine the degree to which the standard is met at that point in time. The results of those surveys will not only provide base line data but will also further detail the nature of the problem. It is possible that these surveys will show that the agreed upon standard is being met, that the level of functional reading competence this society deems necessary and is willing to pay for is being achieved. If that is the case, the program will be terminated as the program goal has been met. Although it is perhaps pedantic to make such statements, they are presented here and will be emphasized in the final report because the existence of "a reading problem" has not been empirically documented. Rather, its existence has been asserted by persons who employ the products of our schools, who further educate those products, who are in positions of political power, and who are scholars of the reading process. This assertion has been made so often and with sufficient authority that it has been accepted as fact. We do have a reading problem.

The development of effective components of reading instruction proceeds through two paths. The first of these, shown in the top row in Figure 4, involves the research on models as specified in Product #1 in Phase I. Through these efforts models which are communicable, internally consistent, data based, and predictive will be generated and used as the basis for inventing and testing prototype instructional procedures, materials and equipment.

Concurrently systematic efforts to improve a variety of existing reading instructional practices will be undertaken (labeled *A*daptive *E*xperimental *L*aboratories—AEL's—and shown as the bottom line in Figure 4). These projects will involve ongoing reading instructional programs augmented by reading and evaluation expertise. The operational procedure of the AEL's will include

1. Specification of the behaviors to be produced via instruction;
2. Observation and recording of instructional processes used;
3. Measurement of outcomes;
4. Analysis of the discrepancy between behaviors sought and the outcomes;

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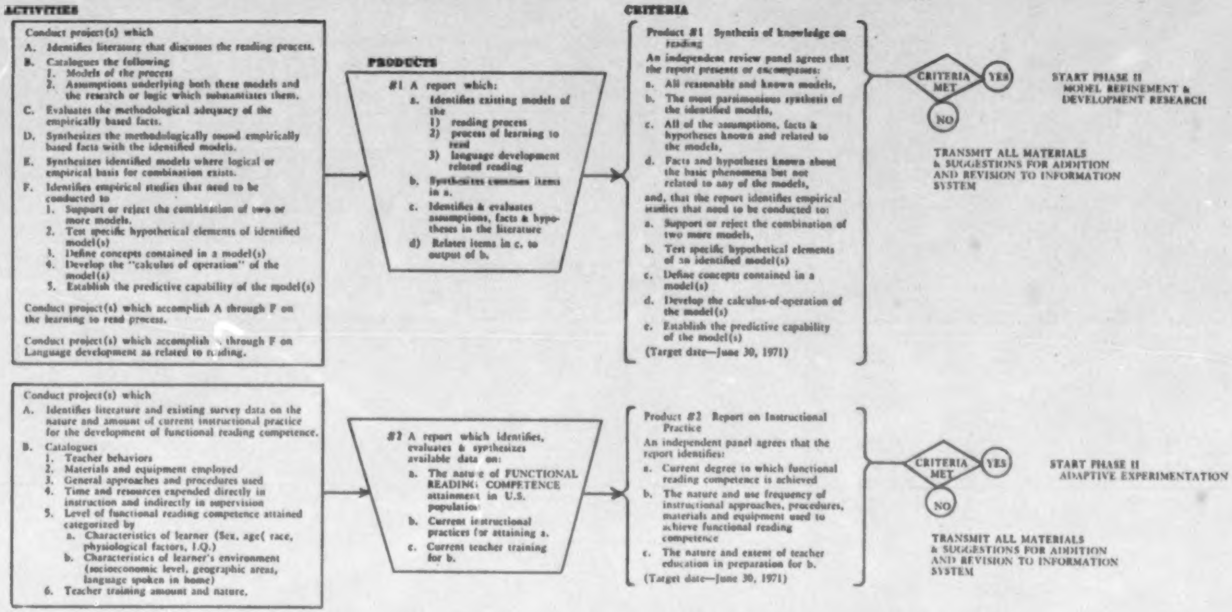
R & D for Reading Program-Phase I



ACTIVITIES

Conduct project(s) which
- A. Identifies literature that discusses the reading process.
- B. Catalogues the following
  - 1. Models of the process
  - 2. Assumptions underlying both these models and the research or logic which substantiates them.
- C. Evaluates the methodological adequacy of the empirically based facts.
- D. Synthesizes the methodologically sound empirically based facts with the identified models.
- E. Synthesizes identified models where logical or empirical basis for combination exists.
- F. Identifies empirical studies that need to be conducted to
  - 1. Support or reject the combination of two or more models.
  - 2. Test specific hypothetical elements of identified model(s)
  - 3. Define concepts contained in a model(s)
  - 4. Develop the "calculus of operation" of the model(s)
  - 5. Establish the predictive capability of the model(s)

Conduct project(s) which accomplish A through F on the learning to read process.

Conduct project(s) which accomplish [illegible] through F on Language development as related to reading.

PRODUCTS

#1 A report which:
- a. Identifies existing models of the
  - 1) reading process
  - 2) process of learning to read
  - 3) language development related reading
- b. Synthesizes common items in a.
- c. Identifies & evaluates assumptions, facts & hypotheses in the literature
- d) Relates items in c. to output of b.

CRITERIA

Product #1 Synthesis of knowledge on reading

An independent review panel agrees that the report presents or encompasses:
- a. All reasonable and known models,
- b. The most parsimonious synthesis of the identified models,
- c. All of the assumptions, facts & hypotheses known and related to the models,
- d. Facts and hypotheses known about the basic phenomena but not related to any of the models,

and, that the report identifies empirical studies that need to be conducted to:
- a. Support or reject the combination of two more models,
- b. Test specific hypothetical elements of an identified model(s)
- c. Define concepts contained in a model(s)
- d. Develop the calculus-of-operation of the model(s)
- e. Establish the predictive capability of the model(s)

(Target date—June 30, 1971)

START PHASE II
MODEL REFINEMENT &
DEVELOPMENT RESEARCH

TRANSMIT ALL MATERIALS
& SUGGESTIONS FOR ADDITION
AND REVISION TO INFORMATION
SYSTEM

Conduct project(s) which
- A. Identifies literature and existing survey data on the nature and amount of current instructional practice for the development of functional reading competence.
- B. Catalogues
  - 1. Teacher behaviors
  - 2. Materials and equipment employed
  - 3. General approaches and procedures used
  - 4. Time and resources expended directly in instruction and indirectly in supervision
  - 5. Level of functional reading competence attained categorized by
    - a. Characteristics of learner (Sex, age(race, physiological factors, I.Q.)
    - b. Characteristics of learner's environment (socioeconomic level, geographic areas, language spoken in home)
  - 6. Teacher training amount and nature.

#2 A report which identifies, evaluates & synthesizes available data on:
- a. The nature of FUNCTIONAL READING COMPETENCE attainment in U.S. population
- b. Current instructional practices for attaining a.
- c. Current teacher training for b.

Product #2 Report on Instructional Practice

An independent panel agrees that the report identifies:
- a. Current degree to which functional reading competence is achieved
- b. The nature and use frequency of instructional approaches, procedures, materials and equipment used to achieve functional reading competence
- c. The nature and extent of teacher education in preparation for b.

(Target date—June 30, 1971)

START PHASE II
ADAPTIVE EXPERIMENTATION

TRANSMIT ALL MATERIALS
& SUGGESTIONS FOR ADDITION
AND REVISION TO INFORMATION
SYSTEM

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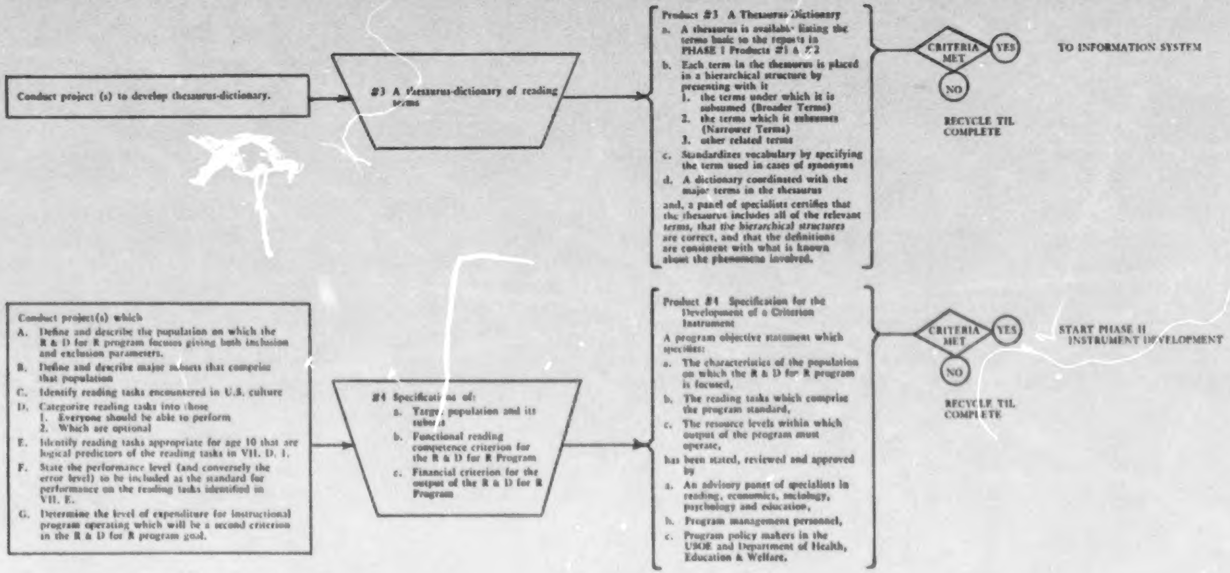

Conduct project (s) to develop thesaurus-dictionary.

#3 A thesaurus-dictionary of reading terms

Product #3 A Thesaurus Dictionary

a. A thesaurus is available listing the terms basic to the reports in PHASE I Products #1 & #2

b. Each term in the thesaurus is placed in a hierarchical structure by presenting with it
  1. the terms under which it is subsumed (Broader Terms)
  2. the terms which it subsumes (Narrower Terms)
  3. other related terms

c. Standardizes vocabulary by specifying the term used in cases of synonyms

d. A dictionary coordinated with the major terms in the thesaurus

and, a panel of specialists certifies that the thesaurus includes all of the relevant terms, that the hierarchical structures are correct, and that the definitions are consistent with what is known about the phenomena involved.

Conduct project(s) which

A. Define and describe the population on which the R & D for R program focuses giving both inclusion and exclusion parameters.

B. Define and describe major subsets that comprise that population

C. Identify reading tasks encountered in U.S. culture

D. Categorize reading tasks into those
  1. Everyone should be able to perform
  2. Which are optional

E. Identify reading tasks appropriate for age 10 that are logical predictors of the reading tasks in VII. D. 1.

F. State the performance level (and conversely the error level) to be included as the standard for performance on the reading tasks identified in VII. E.

G. Determine the level of expenditure for instructional program operating which will be a second criterion in the R & D for R program goal.

#4 Specifications of:

a. Target population and its subsets

b. Functional reading competence criterion for the R & D for R Program

c. Financial criterion for the output of the R & D for R Program

Product #4 Specification for the Development of a Criterion Instrument

A program objective statement which specifies:

a. The characteristics of the population on which the R & D for R program is focused,

b. The reading tasks which comprise the program standard,

c. The resource levels within which output of the program must operate,

has been stated, reviewed and approved by

a. An advisory panel of specialists in reading, economics, sociology, psychology and education,

b. Program management personnel,

c. Program policy makers in the USOE and Department of Health, Education & Welfare.

FIGURE 3

5. Modification of the instructional program based on this analysis; and
6. Recycling until the program standard is met.

Success in either the model or adaptive experimentation line yields a prototype. Its effectiveness must be subjected to independent confirmation before the phase is complete. This confirmation activity is shown as Activity 4 in Figure 4.

Instructional System Design and Delivery

Successful completion of Phase II occurs when proven effective components for an instructional system have been developed. The integration of those components into an effective instructional system, the development of the means for the delivery of that system, and the selection of implementation strategies comprise the remainder of the program. Details for these phases cannot be specified until progress in Phase II is apparent. Their general nature was examined by the Planning Team and will be reported in the project final report.

The design and testing of an instructional system presumes that an array of effective system components will have been created. Two types of problems are forseen. Some of the components are likely to be alternatives for attaining a single element of the program goal. Different combinations of such alternatives must be explored to determine overall effectiveness and to eliminate debilitating interactions. The second problem centers on optimal sequencing of the system components.

Once an effective instructional system has been generated, the concentration shifts. Here the work focuses on those materials and approaches that are necessary to make the instructional system operational. Questions in this phase include means for producing the necessary materials and equipment and for developing the local staff expertise for operating the instructional system.

The final phase deals with implementation strategies. To this point in the program the work will have involved samples of students, teachers, and schools in a way that will attest to the generalized applicability of the instructional system or systems. In a society that operates on a principle of local control of school systems the question of implementing effective instructional systems must be considered. Strategies for implementation range from passive announcement, through deliberate education of decision makers, through financial inducements for adoptees, to legislative imposition. The appropriateness of any one or combination of these strategies cannot be specified until information on the nature of the instructional system, the means for its delivery, and the political-social climate of the times is available.

Research & Development for Reading

Phase 2 - - Subobjectives & Criteria

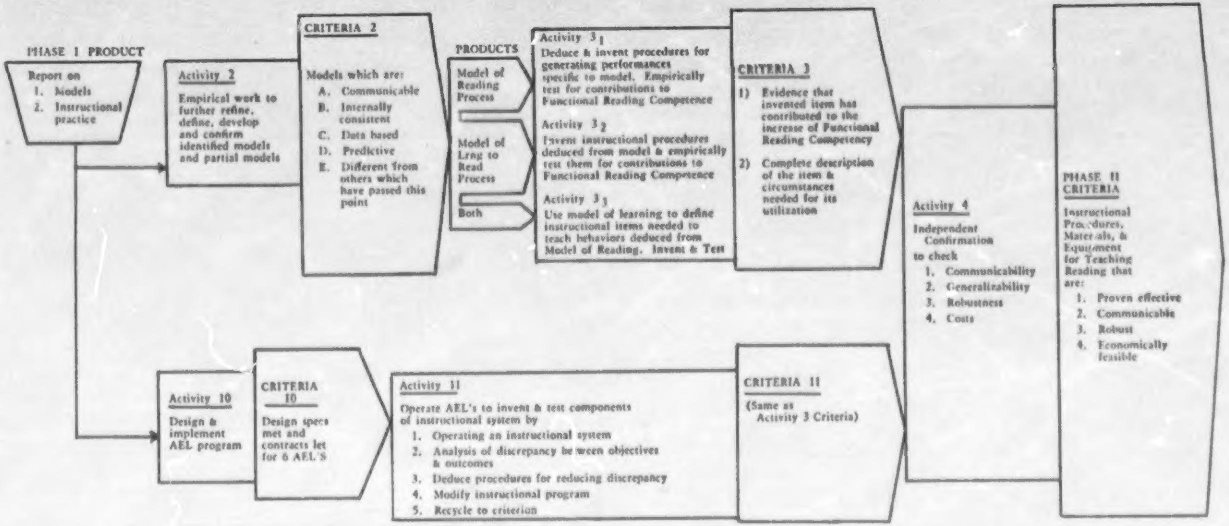
PHASE 1 PRODUCT
Report on
1. Models
2. Instructional practice
Activity 2
Empirical work to further refine, define, develop and confirm identified models and partial models
CRITERIA 2
Models which are:
A. Communicable
B. Internally consistent
C. Data based
D. Predictive
E. Different from others which have passed this point
PRODUCTS
Model of Reading Process
Model of Lrng to Read Process
Both
Activity 3_1
Deduce & invent procedures for generating performances specific to model. Empirically test for contributions to Functional Reading Competence
Activity 3_2
Invent instructional procedures deduced from model & empirically test them for contributions to Functional Reading Competence
Activity 3_3
Use model of learning to define instructional items needed to teach behaviors deduced from Model of Reading. Invent & Test
CRITERIA 3
1) Evidence that invented item has contributed to the increase of Functional Reading Competency
2) Complete description of the item & circumstances needed for its utilization
Activity 4
Independent Confirmation
to check
1. Communicability
2. Generalizability
3. Robustness
4. Costs
PHASE II CRITERIA
Instructional Procedures, Materials, & Equipment for Teaching Reading that are:
1. Proven effective
2. Communicable
3. Robust
4. Economically feasible
Activity 10
Design & implement AEL program
CRITERIA 10
Design specs met and contracts let for 6 AEL'S
Activity 11
Operate AEL's to invent & test components of instructional system by
1. Operating an instructional system
2. Analysis of discrepancy between objectives & outcomes
3. Deduce procedures for reducing discrepancy
4. Modify instructional program
5. Recycle to criterion
CRITERIA 11
(Same as Activity 3 Criteria)

FIGURE 4

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NEXT STEPS

Two recommendations related to this programatic effort have been presented to the Office of Education in the form of an interim report:

1. The program plan proposed in the report of this project (and summarized herein) should be implemented as soon as organizational and budgetary arrangements can be made within the Office of Education.
2. Three projects proposed in the plan are so vital to the attainment of functional reading competence (either through the proposed program or any other effort with the same general goal) that they should be initiated immediately through the USOE Bureau of Research.

The three projects included in number 2 are the two literature searches and the program goal specification described as Phase I.

Work is progressing which will further detail and explicate the work in Phases I and II. As this is completed two reports on the project will be made. The first of these is the traditional project final report. The second will be a USOE monograph for broad distribution throughout the field. Before this latter report is completed, the proposed plan will be critiqued by a variety of specialists. Where there is consensus that modification is warranted, changes will be incorporated.

Previous applications of the Convergence Technique have generated criticisms about the limited number of persons involved in the planning. This is an unwarranted criticism. True, the actual planning team is small in number, but through the invitation of critiques every programatic effort has intentionally involved large numbers of persons in the overall planning. The same statements can be made about this project. Ten different individuals worked through the planning sessions. Six additional persons have contributed as invited consultants. Another five persons were involved in the reading definition conference. Approximately 200 persons have attended sessions during which interim reports were presented and discussed. The involvement of professionals does not stop with those included in the enumeration above. As the program progresses critiques will be received from two groups. One of these will consist of persons specifically invited to submit a critique. The other will be comprised of those interested professionals who on their own initiative submit written reactions to the USOE National Center for Educational Research and Development. These statements should be interpreted as an open invitation for this audience to examine carefully the proposed program plan, identify and document its strengths and weaknesses, and propose alternative activities. This audience should know that as Phase I draws to a close another planning team will be constituted to further detail Phase II. Documented criticisms of the program received by the Office of Education will serve as part of the input for that team's deliberations.

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A New Eye Movement Measure of Reading Efficiency

John J. Geyer
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Much of the history of science can be traced as an interaction between theory and measurement. New theoretical formulations suggest or require new methods of measurement, and new methods of measurement often contribute to new theoretical formulations. In the long history of ideas, this interaction has tended to be enormously fruitful. In the short run, however, the interaction of theory and measurement can lead to the development of tighter and tighter tautologies. This happens when one major theory is dominant for too long: when there are no competing theories to suggest alternative measures.

Until recently, the psychology of reading suffered from this tautological stalemate. Basing its ideas on 19th century neurology and the span of attention psychology of the early 20th century, classic reading theory developed with the basic assumption that visual perception occurs instantaneously at the unit level. The ongoing reading process was thought of as a series of these instantaneous unit perceptions. Increases in reading ability were believed to be largely due to an increase in the size of the unit a reader could perceive instantaneously. Data derived from tachistoscopic experimentation was considered directly applicable to the ongoing reading process, since this process was thought of as a series of tachistoscopic exposures flashed to the brain by the saccadic movements of the eyes.

Since reading was viewed as a series of instantaneous perceptions, it was thought that the comprehension processes associated with a given fixation are completed before the eye moves on to the next fixation. On the basis of these assumptions, Carmichael (1) suggested that it was the completion of comprehension processes which triggers the saccade and that fixation time, therefore, is a measure of the "total complex cognitive time" associated with each "segment or unit of thought" (p. 7). If the saccadic movement was such that the visual spans failed to include some words, a regressive eye movement would be required.

From these basic assumptions, extended but not tested by considerable research, classic reading theory was constructed. This theory suggested speed and comprehension as the two important dimensions of reading. Finer measures were concerned with the physical details of language structure, ranging from phoneme-grapheme correspondences to paragraph structure. The theory was consistent and logical, and the measures suggested by it have served well and will continue to do so. They are in the most part, however, logical abstractions of gross phenomena, related to basic processes in tenuous ways. They have proliferated over the years and remain in confusing, untestable profusion.

THE IMPORTANCE OF TIME

To perceive the need for testing long-accepted assumptions often requires an alternative theoretical viewpoint. During the past decade, an alternative viewpoint has developed which has contributed much to our understanding of language and perceptual processes. Investigators working from the information processing point of view have demonstrated that the assumption of the instantaneous nature of perception is totally false and have developed models detailing the multiple interacting systems operating across time during the processing of information. Not only is time acknowledged as an important variable; it is evolving as *the* important variable, at least in language processing. As Lenneberg (5) summarized in his important work *Biological Foundations of Language*:

> The essence of language is structure and pattern, not any invariant physical detail that could be studied in isolation. The dimensions of language patterns are entirely of a temporal nature. This seems logical enough, *a priori,* since utterances progress through time; however, it is difficult for our imaginations to carry this thought to its logical conclusion. . . . A close study of language and its disturbance illustrates beautifully the all-important role of temporal phenomena (p. 218).

The point is not that the physical details of language are unimportant, but rather that they can be understood only as they occur within temporal patterns. Measurements generated by information processing approaches to reading would be expected, therefore, to be concerned with time, but in the sense of timing rather than speed. (Speed has long been the poorest of reading measures. Overall speed measures are meaningless unless coupled in some way with comprehension measures, but the relationship between speed and comprehension is complex and understood only in gross ways.) The temporal measure needed is one which would reflect overall processing variables: the ability to recognize words, to group them into meaningful units by the effective use of storage, and to keep all systems in balanced equilibrium during ongoing processing: in short, a measure which would reflect the reader's ability to process language in temporal patterns.

THE TEMPORAL EYE-VOICE SPAN

The measure I would suggest as a measure of overall reading effectiveness (in conjunction with comprehension measures) is what I have called the coefficient of constancy (C) of the temporal eye-voice span. This coefficient is obtained by measuring for each fixation in a passage the amount of time elapsing between the beginning of the fixation and the *end* of the voicing of the fixated word. The mean of these temporal eye-voice spans is divided by their standard deviation $(C=\frac{M}{\sigma})$ yielding a number which is larger for longer, more constant spans.

The central importance of the coefficient C can be understood if one views reading as taking place across time through the semi-independent action of several processing and storage systems which can act simultaneously on different sequential segments of language. The unifying factor in such a process is the necessity of maintaining a flexible temporal balance between the input and output systems. Thus the eye is restricted in how far ahead of the voice it can effectively function by the limited amount of time available to process the intervening material. In an article published elsewhere (3), I predicted and confirmed that the amount of time available is one second and that the consistency with which the temporal eye-voice span is maintained from fixation to fixation is closely related to the smoothness of the reading process.

Measuring temporal eye-voice span to the end of the voiced word is an interesting example of the effect theory can have on measurement. Investigators proceeding from classic reading theory measured to the beginning of the voiced word on the rationale that when the word was ready to be spoken all comprehension processes were completed. When reading is viewed as an ongoing temporal process, however, it is clear that until word A is completed, word B cannot be begun. Since word B has already been input, any delay in the voicing of word A will disrupt the temporal balance. The time required to speak a word in oral reading is, therefore, an integral part of the temporal process.

THE PERCENTAGE OF SINGLE, FORWARD FIXATIONS

Regressive eye movements, classically attributed to non-overlapping visual spans, in reality most often reflect the need of the reader to reduce the temporal lead of the eye, either because material previously input has been lost from storage, or simply to mark time while the voice catches up. Some regressions can be attributed to a difficulty in recognizing a word, and a regressive movement will sometimes be made to a point of error without interrupting the temporal balance, but in smooth ongoing reading most regressions are associated with voice pauses at commas and periods. These time-marking saccades are as likely to be in a forward direction as reverse, but in this case they are small, multiple movements on the same word. Therefore, multiple forward fixations on the same word can be classed with regressive saccades as indicants of temporal imbalance in the ongoing process. Only rarely are long pauses found apparently serving the same purpose.

The coefficient of constancy of the temporal eye-voice span is an extremely onerous measure to obtain with today's equipment. For that reason, it is practically useless to schools and clinics. The percentage of single, forward fixations to total fixations, however, can be easily obtained with any eye movement measuring procedure capable of accurately determining the point of regard. In my experimental data, 24 pairs of these two measures obtained from eight subjects reading three passages of varying difficulty produced a correlation of .93 when ranked without regard for subject and passage differences. If this relationship proves stable in replication, it would indicate a measure of high generality.

CONCLUSION

The evidence for the above statements is taken from time graphs showing the simultaneous action of eye and voice during each 1/30th of a second over entire passages. The experimental procedures and results of analysis are reported elsewhere (2, 3) as are the actual graphs (2). A paper detailing the systems hypothesized as operating during the reading process and the experimental evidence from which they were derived is in press (4). It is not within the purpose of this paper to repeat that material here. Rather, I wish to underline the need for a reexamination of our most basic ideas concerning the nature of the reading process and the equally important need to devise measures of reading ability which reflect these basic processes. As a beginning, I am suggesting what seems to me to be the central eye movement measure around which other measures vary: the coefficient of constancy of the temporal eye-voice span. For clinical work, the more easily obtained percentage of single, forward fixations would seem to be equivalent.

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Lexical and Structural Items As Predictors of Readability for High and Low Ability Readers

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The general question asked is this: do linguistic variables which make for difficulty in one reader affect all readers at every reading ability level in the same way and to the same extent? Bormuth's (1966, 1969) research tends to support the notion that variables which influence reading difficulty have an equal influence on persons at all reading ability levels. Chall (1958) pointed out that different formulas, specifically the Dale-Chall and the Lorge, are each adapted to a different age range. This suggests that linguistic variables act differentially on readers of different abilities or age levels. Weaver (1965) suggested the possibility that poor readers provide a more consistent estimate of reading difficulty than do better readers; and structural elements in the language more consistently index reading difficulty for the poor readers than do lexical units in the language.

To approach this general problem in some specific way, the following hypotheses were set down: (a) there are significant differences among certain linguistic variables as measured by the cloze, specifically between lexical, structural, and nth deletion cloze responses; (b) there are significant differences among subjects at different levels of reading ability as measured by the cloze; (c) there are significant differences among levels of readability as measured by the cloze; (d) there are significant interactions among certain linguistic variables as measured by cloze, and different levels of reading ability; (e) structural words or units are the best predictors of reading difficulty among the linguistic variables tested by cloze measures; (f) the structural deletion scores of poor readers are the more consistent predictors of reading difficulty than are the structural word scores of better readers.

SUBJECTS AND TESTING

The subjects were drawn from the entire student population, grades 8-12, of a high school in Northeast Georgia. STEP 3A and 2A were given to all students. The cloze instrument was given two weeks later. The raw scores were converted according to the test publisher's value for converted scores in order to equate the scores of both forms. Fifteen subjects who scored below chance were discarded. The subjects were then divided into three equal groups. The subjects at each reading level, high, middle, and low, were randomly assigned to one of nine treatment conditions within each level. The cloze test was introduced with written instructions, which are read out loud to subjects, and with warm-up cloze task. The STEP was given and scored according to publishers' standard instruction and keys. The cloze task was untimed, and no one was asked to stop before finishing. The cloze was scored by counting correct the number of exact words replaced, or the unambiguous misspellings of the exact right word.

CLOZE PASSAGE CONSTRUCTION

The cloze passages were constructed from six of the twenty passages which Bormuth (1966) ranked according to reading difficulty. Using the Bormuth scaling, one is easiest and twenty the most difficult. The passages used in this study were two and part of three, eleven and part of twelve, nineteen and part of eighteen. This was done to give a reasonably representative sample of high, middle, and low readability. Low readability is difficult reading. In order to delete every fifth lexical unit (noun, verb, adjective) more text was required than was necessary for deleting every fifth word. Each passage was deleted in three separate ways: nth unit, lexical unit, and structural unit. Each test included fifty deletions.

ANALYSIS OF DATA

An analysis of variance was done on the three major variables: readability, reading ability, and deletion type. A correlation matrix was computed for five variables, with attention to the relationship of reading scores to deletion scores. A split-half reliability coefficient was calculated to determine reliability of the cloze instruments. To further check the three-way analysis, three two-way analysis of variance were computed with one deletion type as the dependent variable in each.

RESULTS

Table one shows the three-way analysis of variance. There were significant differences among the nth, lexical, and structural deletions. The Duncan range test at .05 level showed that each deletion type was significantly different from each other deletion type, and in the orders expected from other studies. Lexical cloze was most difficult, nth deletion cloze units were intermediate in difficulty, and structural cloze units were the easiest to replace. Mean cloze scores were 15.7, 20.6, and 27.6, respectively.

There were no statistically significant differences among levels of reading ability as measured by the cloze test. This difference had been expected because several studies have reported correlations from moderate to high between cloze tests and multiple-choice reading comprehension tests. (Bormuth 1963, Taylor 1953). There were no statistically significant differences among levels of readability when readability level is defined by Bormuth's (1966) every nth word deletions. This was a surprising finding. An examination of the means of the

TABLE 1
Analysis of Variance Summary Table

Source of Variance	df	Sum Squares	Mean Squares	F
Readability	2	426.652	213.326	2.500
Deletion Type	2	11,054.626	5,527.313	64.785**
Reading Ability	2	6,813.268	3,406.634	39.929**
Readability by Deletion Type	4	2,224.055	556.013	6.517**
Readability by Reading Ability	4	106.707	26.676	0.313
Reading Ability by Deletion Type	4	215.876	53.969	0.633
Readability by Reading Ability by Deletion Type	8	194.090	24.261	0.284
Error (within cell)	439	37,454.454	85.317	
Total	465	58,961.951		

** p = .01

cloze task over the readability levels indicates that a statistically significant probability level would not have supported Bormuth's difficulty ordering, however, since the first and last passage scale lower in difficulty than does the middle passage.

A significant interaction was found between deletion type and readability. The correlation between cloze and STEP scores was .41. The split-half reliabilities for the nine cloze tests ranged from .84 to .98.

The hypothesis that there are significant interactions among one or more of the linguistic variables and reading ability was not confirmed. However, the mean structural scores of poor readers across readability suggests this possibility.

DISCUSSION

Readability is generally defined as a complex set of interrelated factors. The definition given by Dale and Chall (1949) implies that the handling of interactions in data derived from cloze procedures be treated with some care. Taking interactions seriously may help in locating and identifying new variables and new relationships. These findings suggest that, given the current state of refinement in use of the cloze, dismissing interaction is unwise. This general suggestion is not regularly adhered to by all cloze users. Bormuth (1966) tends to play down interactions in analyses. While the variables in this study were not identical with those used by Bormuth (1966), the variables in both are language variables. What the interactions suggests in this study is that readability as measured by the cloze test is related to the type of deletion and to certain characteristics of style.

This interaction clearly shows that passage difficulty, when compared with averaged nth deletion scores across passages (Bormuth, 1966), is not ranked in the same order when the deletions are certain categorized language variables. A search for explanatory variables was made after the interaction was found.

Three variables are offered as tentative and partial explanation for the interaction between passage difficulty and deletion type: simple count of deleted units in the three passages, single word deletions and language habits, and the cue value of the definite article. In the passages used, the count of repeated deletions, and the number of times these deletions are cued in the passage (i.e., the term deleted occurs also in the written text) is the most clearly demonstrated of the three possibilities.

In terms of lexical deletions the following progression occurs: In the easy reading, nth deletion passage, no lexical units occur as deletions more than once. In the lexical deletion passage of the easy reading, there are three units which appear more than once: a total of seven lexical units constitute repeats. Two of these repeated units appear in the written text, providing written cues for a possible five responses. In middle reading difficulty there are no repeated lexical units in the nth deletion passage. There are four lexical units in the lexical deletion passage which appear a total of eight times. Of these, two occur in the written text, providing cues for a possible four answers. In the difficult reading nth deletion passage, there are three units which occur a total of seven times. Two of these lexical units occur in the written text and provide cues for a possible five responses. In the lexical deletion passage, six units occur a total of thirteen times. Four of these appear in the written text and provide cues to a possible eleven responses. To make much of this explanation of the interaction of deletion type and readability, one must assume that subjects use such cues. Whether they do is not certain. That better readers used cues differently from poorer readers is suggested by the cell mean cloze scores of good and middle readers across deletion types. The high and middle readers perform more closely together than do middle and poor readers.

Another cue which may account for some interaction is rare in the language passages used in this study but it must be accounted for in cloze test research. In the difficult reading passage the following sentence and deletion occur: "light strips of gold leaf or ——— foil attached to . . ." The suggestion of "gold leaf or" requires some very thin metallic substance to follow. What looks like the deletion of one language unit may be for many language users only the deletion of half a unit. To fill in *"aluminum,"* may be quite different from replacing many other adjectives.

There may be additional cueing help in the use of the definite article. Using the structural deletion passage as the measure, the definite article, "the," occurs twice as often in the hard readability as it does in the structural deletion passages in easy or middle difficulty reading. This specific pointer, along with the occurrence of repeated lexical units and written cues to lexical units, may account for some of the interaction between deletion type and readability level.

Subject and language samples

Subject and language samples are part of a larger issue, that of research design. One possible way to account for no significant differences among readability levels in this study lies in the sample of subjects and the sample of language passages. The passages which Bormuth (1966) originally ranked were ranked by responses of fourth through eighth graders. While Bormuth felt that these constituted a population representative of school children in the United States, the language habits of the Bormuth subject sample may not, in point of fact, be so clearly generalizable as he affirms. The effect of repeated measures is another difference in the Bormuth ranking procedure and the present use of the Bormuth materials. The present study used non-repeated measures. Even if careful counterbalancing had been employed in the original scaling presentations the effect of repeated experience with the cloze over a ten day period would likely modify performance. A subject's responses on the tenth day may well be qualitatively different i.e., the way he processes his storage system. The sample of language passages was taken from instructional materials and would likely fit the students' expectations about which language elements belong in which sequences. Subjects would not be called upon to display the kind of retrieval versatility which would be required by a wider range of language styles. A further limitation on the language sample is that it all scaled from fourth to eighth grade in Dale-Chall readability terms. The lack of significant difference among reading difficulty levels suggests that the language sample is drawn from a restricted range of difficulty and does not constitute a random sample of language. Coleman (1964) asserted that many experiments investigating language characteristics could not be replicated if different samples of language materials were used. The present study demonstrated that even if the same language sample is used, sampling different specific language characteristics within the same passages yields markedly different results from those obtained by averaging nth-word scores.

An assertion is made that linguistic variables can be usually expected to predict readability as well for poor as for good readers. At least this is so for those whose reading achievement ranges from second through twelfth grades (Bormuth, 1966). In the present study the median scores for good, middle ability, and poor readers fall at points which represent about average reading ability for seventh graders, tenth graders, and twelfth graders respectively. The subjects in this study encompass the range cited by Bormuth, but they ranked the passages differently. This suggests that (1) age is a factor not accounted for, but which interacts with linguistic variables; (2) or that linguistic variables which Bormuth manipulated are not the only critical ones; (3) or that passages which were chosen and ranked initially were not randomly selected and therefore represent a truncated range of difficulty, and probably of style.

Standard reading tests and cloze

Traditional reading formulas generally achieve correlations in the .70's with criterion measures (Klare, 1963). Bormuth (1969) states that multiple-choice reading tests and nth word deletion cloze tests measure skills which are closely related, that is, the two kinds of tests do not tap differing skills. The present study found a .41 correlation between cloze scores and STEP reading tests. The .41 was calculated on all deletion types at all reading ability levels and at all passage difficulty levels. Although there was some overlap from passage to passage, at least half of all the words in each passage were sampled. This finding is in line with the Weaver and Kingston (1963) finding of low correlations between cloze scores and standard reading scores. This result argues against the idea that cloze and standard reading tests measure nearly identical skills. The finding of .41 is also in line with Rankin's (1957) contention that neither pre-cloze nor post-cloze tests are sufficiently accurate to measure general reading skill for prediction purposes when criterion of general reading skill is a standardized reading test.

Correlations and cloze validity

Validity is not demonstrated by correlations. In fact, the present finding of .41 between STEP and cloze scores argues against the usefulness of correlations employing averaged cloze scores across a passage as a measure of readability or comprehension. Bormuth (1966) found that in 13 out of 20 passages, significant mean differences were identified among the five mean scores tabulated on each passage, prior to averaging.

CONCLUSION AND IMPLICATIONS

Two of the basic linguistic categories which the cloze procedure is capable of sampling are lexical and structural categories. The cloze as currently used is of questionable value as a precise measure of readability because the nth word deletion confounds at least two basic language categories and does not reflect the interactions of language elements within constraints of language passages. Greater attention must be paid to random sampling of subjects and language passages if the results of language experiments using cloze are to be meaningfully generalized.

With refinement, the cloze may be developed into a readability estimate more accurate than many estimates now available.

The cloze is potentially a strong tool for estimating passage difficulty at several cognitive levels.

Since structural units tend to be the best predictors, the cloze may be very helpful in identifying certain linguistic variables in the structural unit category.

Through use of cloze and structural deletions, it may be possible to more readily identify problem readers.

A systematic series of replications and modified replications of previous work done with the cloze should be undertaken. This should be done in the framework of a few clearly important variables at one time, careful sampling of subjects, close attention to design, a broad range of ages, and careful analysis of interactions located among subject variables and linguistic variables.

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Information Gaps in Research In Reading Comprehension

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On examining the research into reading in this century an interesting paradox can be discerned. The "conventional wisdom" of the field has long reiterated that the reading act cannot take place unless meaning is attached to what has been read, and yet the investigation of reading comprehension has lagged far behind that of all other areas of reading. One of the reasons for this lack lies in the nature of the complexity of this activity, for its performance is usually less overt and much has to be examined indirectly by inference. Moreover, until comparatively recently there has been the frequent assumption that if words are decoded, meaning will be automatically understood. Furthermore, as I have suggested elsewhere (1) this area of study is plagued by the problems attendant on research in the frontier of any field.

Research into reading comprehension has gone through various phases of development during this century. The early studies, undertaken mainly by psychologists, were directed towards defining reading by devising ways of measuring the total reading act. Later projects attempted to identify and measure the various aspects of comprehension, which had been recognized either intuitively or approved by the consensus of reading experts. This led to investigation into the less obvious aspects of comprehension. Until the midfifties, perhaps the most fruitful area of research investigation was the application of factor analysis to the various tests of reading comprehension in order to determine the independence of the various aspects contributing to printed materials. These studies, inevitably bore the hallmark of factorial studies in that the findings tended to be somewhat circular, as only those factors which were involved in the comprehension tests used, could be identified. During the fifties, attempts to examine the *process* rather than the *product* of reading comprehension, as instanced by comprehension tests, were made. A variety of methods were used, one notable revival being the analysis of the introspective and retrospective comments of the readers themselves on the processes they appeared to be using as they read (2, 3, 4). This process analysis stage has led during the sixties to the devising of a number of models to examine this phenomena. The last two years have seen a veritable flurry of activity directed towards attempting to make an appropriate operational definition of reading for the purpose of more efficiently directing research efforts in reading comprehension.

It is not the purpose of this paper to give a detailed analysis of the many facets of reading comprehension which have been investigated, but an attempt will be made to present a brief overview of five areas and in each area suggest information gaps which are now apparent and which seem ripe for investigation.

The five areas will be: 1) the verbal understanding of linguistic information, 2) problems inherent within the material, 3) factors within the reader, 4) the possible differences between the developing reader and the accomplished reader, and 5) attempts to improve performance in reading comprehension.

VERBAL UNDERSTANDING OF LINGUISTIC INFORMATION

Basic to this problem of understanding reading comprehension is one which is much greater. It is still intrinsically a mystery how thought is conveyed by words from one human being to another. It has long been recognized that reading comprehension is one facet of language communication as a whole. Russell (5) suggests that the nature of verbal understanding is so complex that researchers frequently become overwhelmed by the enormity of the task involved. Wiener and Cromer (6) in their article, "Reading and Reading Difficulty: A conceptual analysis," have done much to focus attention of interested personnel upon some of the ambiguities within the field which have prevented success in arriving at definitive conclusions about reading. They postulate that four areas need to be distinguished: identification versus comprehension, acquisition versus accomplished reading, relative versus absolute criteria, and reading versus language skills. In relation to the first problem, while acknowledging that even at the word identification stage, some awareness of meaning is essential, they suggest that the comprehension process may be examined independently. They recognize, however, that an adequate ability in the reception of auditory language may be basic to both identification and comprehension.

Several linguists examining comprehension have tended to deal explicity with the role of language behavior in reading (7, 8) and suggest that the comprehension of written discourse becomes available primarily through the auditory form of language. They base this on the fact that the reader apparently makes a transformation from the visual to the auditory form and assume that comprehension therefore follows. Carrol (9) sees the activity as divided into two processes: the first process is the construction or reconstruction from the written message into spoken message or some internal representation of this; the second process consists of the comprehension of the message so constructed or reconstructed. While Carrol recognizes that these two processes may occur together and in teaching cannot be separated, he suggests that it will be more fruitful to look at these aspects separately. He concedes that he does not completely understand the process of comprehension whether it is of speech or writing, but he does suggest that it appears that comprehension in reading derives directly from a reader's lexical, grammatical and ideational speech repertoire. It follows therefore that for Carrol, problems of reading comprehension arise when printed materials contain lexical, grammatical or ideational concepts which may be outside or perhaps less familiar than the majority included within the speech repertoire.

Ausubel (10) however, argues that whatever meanings emerge in comprehending any message whether it is written or spoken, cognitive structuring must be involved. Meaning occurs when material is related to the reader's or listener's existing knowledge and when the ideas contained in the new material are outside an individual's existing structure of knowledge, a cognitive process rather than a conceptual process is at work. He suggests that spoken language is understood and the potential of meaning of a sentence perceived when the recipient can construct meaning from lexical and syntactic functions of the words of the message. This perceived potential meaning is then related to the individual's present cognitive structure and allows the individual to grasp propositional meaning. He argues further than once a requisite ability in the perceptual activity involved in reading is achieved, the spoken language need no longer provide the intermediate step in the reception of potential meaning from written passages.

One basic assumption of all these theories which is obviously fallacious is that the spoken word and written word are identical. As yet neither research or theoretical studies of language have revealed many of the differences between spoken and written language. Linguists have frequently commented upon this, but only recently have some of them begun to indicate in sufficient detail the *nature* of the differences between spoken and written language. Abercrombie's (11) comments are particularly pertinent to some aspects of written language which may inhibit comprehension. Even superficial analysis however reveals many major differences between spoken and written discourse, which may confound certain comprehension activities.

The memory or association factor which must occur when ideas are assimilated from language has also had scant attention until recently. Yet the ways in which the recipient receives and processes information he receives, may be very pertinent to our problem. Miller (12) has undertaken some basic research here. How far this activity is affected by temperament, by intrinsic ideational styles, by previous experience and training, or whether there are generalities implicit in both the method and the content of communication which applies to all humans, has yet to be ascertained. Currently, a doctoral student of mine is investigating how organization in memory processes is related to recoding and comprehension, and will attempt to assess whether semantic or linguistic factors seem to have the greater impact for different individuals (13). It would thus seem that investigation into the means by which humans communicate through words is basic to our total understanding of reading, but this must be linked specifically with the reading act. The following are but a few of the major topics requiring study, but have priority in terms of engendering new information.

1. The nature of verbal understanding with particular reference to the differences between spoken and written discourse.
2. The ways in which memory and association function in assimilating meaning.
3. Ways in which meaning accrue to linguistic symbols.

All these are huge topics, and each will necessitate prolonged investigation, but unless we recognize that they are basic to sound understanding, isolated forays into comprehension research will prove abortive.

PROBLEMS INHERENT WITHIN THE MATERIAL

Two major areas have been investigated in terms of the problems which arise because of the nature of the material to be read. The area which has accumulated the greatest amount of information is that of the language variable within the material.

The part played by the language variable in written material was the factor which triggered the early work of the investigators of readability. For many years writers have maintained that the degree to which an individual comprehends a written passage is at least partially a function of the complexity of the language within it. Again unfortunately, complexity has had various meanings for different researchers. In the last few years, however, this type of research has been greatly influenced by linguistic studies.

A number of investigations into the difficulty level of material using the tools of linguistic science for analysis have assessed some of these problems. The work of Strickland (14) in analysing basal reader series to determine sentence patterns and the relationship to oral language development of children in grades 1-6, has had a profound influence. Ruddel (15) refining on this technique, looked at some linguistic variables which influence oral reading and comprehension performance at these grade levels.

Robertson (16) was concerned with the embeddedness of ideas and its influence on comprehension. She maintained that ideas may be conjoined as well as embedded but whether embedded or conjoined, the association of such ideas is partially achieved through the connectives which join them. The understanding in reading which children have in grades 4, 5, and 6 of connectives that occur in the basal readers was then determined. Nurss (17) investigated the hypothesis that sentences of more complex syntactic structure would be more difficult for primary grade children to read than would sentences of less complex syntactic structure. Her findings suggests that while the less complex structures were easy to understand in oral and silent reading they were more difficult to understand in the listening mode. At the beginning reading level, vocabulary still contributes the largest amount of variability in reading difficulty. However, syntactic structure affected reading difficulty when measured by oral reading errors but did not have a measurable affect when comprehension was assessed through a non-language mode.

Rinne (18) has recently reported a study which attempted to improve reading comprehension through increasing awareness of written syntactic patterns. Although the results did not indicate an overwhelming improvement, the study did discover a high correlation between pattern awareness and literal comprehension in reading. This suggests that the process of comprehension must contain within it a process of recognizing the syntactic relationship between words in the written passage. Fagan (19) investigated the numbers and types of transformations which were found in the language of three basal reader series at grade 4 level and then attempted to determine the difficulty which these structures presented for pupils aged 9-12 years and in grades 4, 5 and 6. Many findings pertinent to our understanding of the way in which language functions resulted from this study. One of the main ones is that the very presence of certain transformations within the written language correlates highly with the difficulty of both sentences and passages. The two transformations which cause the greatest difficulty are embedding and deletion. A rather unexpected finding was that the number of transformations per sentence was not such a significant factor as the type of transformations in determining difficulty. A not unsurprising finding was that students tended to find easier those written structures which are ordinarily found in oral language, interrogatives, expletives, direct quotations, questions.

Several studies (16, 19, 20, 21) have attempted to identify and describe the syntactic elements in textbooks used by children in schools. Cossitt (20) indicated that in her analysis the prenominal adjective was the structure that appeared most frequently in all high school social studies texts. It was suggested that this also appears to be the most complex grammatically as it is more deeply embedded than other structures with the exception of the prenominal participle which has the same degree of embedding as the prenominal adjective. Ratekin (21) analyzing materials in history and chemistry found that it was not possible to claim differences in grammatical structures within the sentences selected from these subject textbooks. His analysis suggests that the lack of statistical equality in distributions of transformations from texts within the same field indicates that author differences rather than subject differences tend to explain the structural differences within texts. There appeared to be a tendency however, for sentences within history texts to have a wider variety of structures present than in the chemistry texts, in terms of the types of transformational rules. Yet both types of material included many great differences in useages of transformational rules.

The number of types of transformations which the author chooses to use and also the constraint of the cognitive discipline under which he is operating may present problems to readers who are unaware of the nature and impact of these controlling factors (22). Not only the substantive content but also the level of concentration of concept presentation may also form a barrier (23). In addition, the tone of the writer, his attitude towards both his subject and towards the reader all apparently can affect the level of comprehension (24, 25). But yet this information while it is accummulating still leaves us on the very brink of our understanding of the interacting elements which both language and its cognitive associations may present to the reader.

To further our understanding of the problems presented by written materials the following areas need to be investigated:

I. Further linguistic analysis of the language of textbooks needs to be undertaken. Are there differences between language structures used in expository writings and in imaginative ones —between science and literature?

II. The relative importance of the reader's linguistic competence as opposed to his linguistic performance, in understanding the written word.

III. The nature and effects of redundancy as clues to comprehension in both written and spoken language.

IV. The problem of linguistic flexibility—its relation to intelligence, level of cognitive development and temperament.

FACTORS WITHIN THE READER

Though some studies have attempted to assess the methods by which human beings process language information obtained from reading, the majority have tended to emphasize those abilities and attitudes as well as aptitudes which are conducive to higher levels of comprehension. The results suggest that not only intelligence, but appropriate levels of cognitive development including vocabulary and concept formation are prerequisites to comprehension.

Studies have tended to fall into two major areas, those which are connected with the "cognitive domain" as it functions in reading, and those in which the "affective domain" is most important.

Cognitive Abilities Many experts have given summaries of the cognitive processes which they felt were involved in the reading process. One of the best known is that by Gates.

> . . . However, to say that reading is a thought getting process is to give too restricted a description. It should be developed as a complex organization of patterns of higher mental processes. It can and should embrace all types of thinking, evaluating, imagining, reasoning, and problem solving. Indeed it is believed that reading is one of the best media for cultivating many techniques of thinking and evaluating.
>
> (26, p. 4)

Some researchers, following the early view of Thorndike (27) tend to concentrate on reading as a type of problem solving. They suggest that the reader defines the problems when he assesses the author's purpose for writing and determines his own purpose in reading and proceeds through the traditional problem solving steps. Other writers have seen reading in terms of a confluence of convergent and divergent thinking (28, 29). The convergent occurs because the reader must lay his mind open to the precise meaning that the author is presenting but the reader's thinking may become divergent when he reacts to and then assimilates the ideas from the material.

There have also been attempts to transpose general classifications of thinking directly to reading. Thus it has been suggested that associative thinking, convergent thinking, divergent thinking, problem solving and creative thinking all take place at some time in the reading act (30, 31).

Yet another way of examining reading is to look at it in terms of a systems approach and see reading as featuring both an open and closed system (32). This requires extrapolation, interpolation, and re-interpretation in the light of the reader's reaction.

Considerable stress has been placed by others on the cognitive problems involved in both inferring and deriving meaning through both interpretation and extrapolation. Barrett has presented a taxonomy of reading comprehension which details eight types of inference (33). This taxonomy also emphasizes the problems of reasoning in reading and suggests that the reader must be aware of the logical and psychological problems involved in the ideas presented. This logical analysis will be dependent upon the reader's ability to analyze and synthesize and frequently reorganize the ideas and information that is presented. This may be done by means of classifying, outlining, summarizing, and consolidating through synthesis both the explicit and implicit ideas presented. This ideally leads the reader to make the appropriate judgments, go beyond literal comprehension and involves interpretation and evaluation.

One of the earliest distinctions made as a result of research findings was that critical reading abilities were distinct from general reading abilities (34, 35). Factor analysis of comprehension tests have an almost unanimous finding of a factor which is labelled "abstract reasoning" (34). Fairly early too it was established that though there was a minimal general factor in reading comprehension, major differences arose with respect to reading in various content fields. This has more recently been re-inforced by Davis' latest research (36). It is obvious that as far as cognitive processes are concerned, each substantive field of knowledge will present different modes of thinking when presented in written form.

One other factor appears to be that the cognitive nature of the writer's thought does not necessarily elicit an identical mode of thought response in the reader. However, this has rarely been investigated in depth, although several pieces of research, mostly still unpublished in the form of doctoral dissertations, indicate that this is probably so. A major factor in comprehension errors committed by readers may be their failure to be able to identify or empathize with the thought of the writer. A further problem occurs too, in that there may be cognitive limitations of the reader in terms either of his developmental maturity or of his unfamiliarity with the topic of the material (2, 3, 4, 37, 38).

Several years ago Russell (39) suggested that "in all probability an inadequate vocabulary is the greatest single cause for failure to read with comprehension in either the general or technical field." Research has since substantiated this comment in detail, but further work has also shown that an adequate knowledge of vocabulary depends on the depth and breadth of meaning, as well as the ability to understand the meaning of a word in use or in context (40). This understanding includes the ability to comprehend the metaphorical and idiomatic use of words and phrases, as well as the opposite meaning of words with multiple meanings. A recent study by Ames (41) has shown that readers use a variety of processes to determine word meaning through the use of verbal context. The responses of the subjects seemed to indicate that ability to comprehend accurately, knowledge of word order and syntax knowledge of structural endings, and background experience, seemed to be the most important predisposing conditions to the effective deduction of meanings from context.

Strang (42) has summarized the insights gained from introspective and retrospective analysis of the reading process, and in particular has indicated ways in which the able reader is differentiated from the less able.

Yet though the consensus of the research findings suggests that there are common elements in the cognitive functioning of individual readers, there is also considerable evidence that in specific situations the affective element may be the controlling factor.

Affective Influences Several recent studies have shown how comprehension is subject to the biases and attitudes of the reader and that such prejudices may be a product of the total environment, both within and without the schools, which surround the child (43, 44). It has also been shown that both the interest and the purposes of the reader will affect the level of his comprehension (45). Yet, while single studies have revealed this, there is not sufficient weight of evidence, as yet, to indicate the nature of the problem of determining bias, attitudes, interest, purposes, or prejudices, and how to influence these. There are still not sufficient cumulative research results upon which we can proceed with realistic security.

Some recent research with respect to the factors within the individual reader, has attempted to examine the impact of the psychological notion of cognitive style, and to attempt to assess how this will reflect the ability of the reader to read critically or independently (46). It has also been generally conceded that appreciation will reflect to a major degree an individual's subjective preferences, yet again these influences are diverse. Studies which have revealed these have usually been concerned with examining the activities involved in reading literature (47, 48, 49).

Though research has been more plentiful in the exploring the personal determinants of reading performance, gaps in basic knowledge remain. Pertinent areas for continued study seem to be:

1. The nature of the unique qualities of cognitive functioning which are specific to the reading process. How does the thinking triggered by reading differ from other types of thinking?
2. The nature of cognitive activity elicited by different types of content, for example in imaginative as opposed to logical materials.
3. The nature of the interaction of the cognitive and affective factors in reading comprehension.
4. The problem of determining whether differing written genres or type of content result in differential reading performance, both between and within individuals.
5. The interrelationships of cognitive style and the personality variables which inhibit effective reading comprehension.

THE DEVELOPING AND THE ACCOMPLISHED READER

The differentiation of the research findings between the skills and activities involved as the child acquires reading skills, whether of recognition or comprehension type have not always been clearly defined by investigators as compared with the skills of the accomplished reader. There is not only a lack of recognition of this differentiation in the literature; there also appears to have been a complete failure to recognize that this might be a problem. It would appear self-evident that the quality of the conceptual thinking which goes into selecting the relevant from the irrelevant at a grade 3 level only compares at a superficial level with that required at grade 12.

It may necessitate quite different cognitive skills which would diverge in terms of kind as well as in terms of the ability of the reader to manipulate more difficult concepts.

Moreover, there appears to be a tendency for writers who have attempted to relate the sequential development of cognition and language as suggested by Piaget and his associates on the one hand, and Luria and Vygotsky and their compatriots on the other, to apply this knowledge directly to the reading process. A recent piece of research examines this in more detail. Rawson (50) examined the extent to which the cognitive operations which are available to ten year old children are equally utilized by them in concrete situations and in reading situations. The operations involved the manipulation of identical concepts in classifying, conserving, deduction, induction and probability reasoning. There was overwhelming evidence that there was a considerable lag between the acquisition of operations in reasoning in concrete situations and in their application in reading situations. This study has pertinence not only for our work in reading but possibly for our understanding of the relationship of the emergence of abstract and formal level of reasoning from the concrete operations of early childhood. It may be that the printed word in our society is one of the major factors in promoting this maturation.

It seems possible that this cognitive lag may not be the only type of discrepancy that exists between the various types of perceptual and cognitive activities which separate the immature reader from the accomplished one. The latter has over a period of time acquired a variety of consistent cognitive operations which are readily available and skillfully applied.

It is perhaps surprising that investigations into the diversity of the distinctions between emerging reading behavior and the accomplished reader have been so few. Since the publication of Gray and Rogers' "Maturity in Reading" (51) few studies have examined this important area. There is a yawning chasm rather than a gap here. Yet is would appear that such investigations might be the most productive in terms of producing more definitive bases from which to derive appropriate techniques for teaching comprehension.

Some topics in urgent need of exploration with respect to the means by which the reader gradually becomes more accomplished are:

1. The relationship between the developing cognitive and language abilities of children and the ability to transfer these to the reading task.
2. The sequence of levels or stages through which the reader obtains comprehension mastery.
3. The part played by reading in developing cognitive maturity.
4. The relative impact of cognitive and linguistic deficits upon reading performance.

5. The nature of the apparent lag between the ability to manipulate concepts when presented concretely as opposed to their reception through print.

IMPROVING PERFORMANCE IN READING COMPREHENSION

Theae are numerous studies, particularly in the form of doctoral dissertations which have attempted to assess the various ways in which the quality of comprehension might be improved if more effective teaching strategies or learning activities were evolved. As with so many studies in methodology, few definite conclusions have been reached. Most tend to show that with training, comprehension improved but specific experimental techniques tended not to have a statistically significant impact. Most of these doctoral studies suffered because they were comparatively short projects usually lasting less than one school year.

In recent times with larger projects being funded and mounted by teams, more efficacious investigations have been completed. Most of these have undertaken to explore facets of critical reading.

The results of the Productive Thinking Program of Covington and Crutchfield (52) seem to indicate the children who have specific training were more willing and able to use cognitive skills and strategies which were common both to creative problem solving and reading. Their reactions showed greater precision and discernment in reading.

A comprehensive study undertaken at Ohio State University (55) which attempted to determine whether or not children in elementary grades could be taught to read critically is one of the most productive which has been concluded in recent years. Both teaching units and a critical reading test were developed. Before embarking on teaching strategies an extensive operational definition of critical reading and the identification of specific skills were evolved. In addition an appropriate observation instrument for classroom use was devised. The results suggest that the teaching of critical reading in the later grades of the elementary school was indeed feasible. But it re-emphasized that the quality of the achievement was influenced by intelligence, general reading ability and personality. In terms of teaching skill, the ability of the teacher to ask questions and to interpret responses skillfully was apparently the key factor.

Other research (56) has shown that the questions the teacher asks, determine to a large extent the type of thinking the student will undertake as he reads. Ennis (57) has also undertaken a study on critical thinking at the adolescent level. His first report explored deductive logic in adolescence. In general he concluded that progress in mastering specific deductive operations could be acquired by specific training though there were many individual differences.

There is a considerable body of additional information and theories about learning and cognition, about attitudes concerning sterotypes and dogmatism and value orientations, that need to be translated into classroom practice. Co-ordinated research and development team projects appear more likely to yield fruitful teaching techniques and learning strategies, than individual investigations into possible methods. Innumerable development projects aimed at improving reading comprehension are needed. These must be well documented and need to use a variety of techniques, including analyses of teacher-pupil interaction. Such projects would not be undertaken with the object of finding the single most effective method, but would, through revealing reactions to a variety of techniques, indicate what activities seem to be most productive for certain learners at particular stages of their development and for specific types of material.

CONCLUSION

This review indicates though a beginning has been made our ignorance of reading comprehension is pervasive and abysmal. Let us not underestimate the enormity of the task, but let us not be daunted by it either. A quarter of a century ago Richards suggested that:

> A list of the vices of reading should put first, as worst and most disabling, the expectation that everything should be easily understood. Things worth thought and reflection cannot be taken in at a glance.
>
> (58, p. 12)

If understanding in reading is difficult, understand that understanding will be correspondingly more so.

Commissioner Allen has recently stated that the educational task of the seventies will be to eliminate reading failures in public schools of the United States by 1980. His suggestion that this task will be analogous to the moon race is not hyperbole. Unfortunately we have much greater ignorance concerning the ways of improving the linguistic and cognitive performance of human beings than had the space agency in 1960 of the regions of the moon. Still, even if our current knowledge is like a fifteenth-century map of the world a mixture of truth and error, we must map the terrain and chart our research pathways so that the knowledge gaps may be lessened. Thus we need the comprehensive, constructive efforts of countless researchers, so that we have cohesive, cogent thrusts forward rather than spasmodic, individual assaults on idiosyncratic targets.

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An Analysis of Reading Proficiency and It's Improvement in University-Accepted Rural Secondary Students

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INTRODUCTION

Because of the complexity of reading, there have been many and varied explications tendered by experts in the field. In spite of the variations in definitions there seems to be one area of common agreement predicated on the assumption that in order to become an effective reader there must be total involvement on his part and that the extent of the individual's involvement is dependent upon the resources which are brought to bear on the reading process.

In the area of reading there still exists a need for more carefully controlled and scientifically treated research. The secondary reading improvement programs are a case in point. A review of the pertinent literature appears to indicate that most investigations of such programs are procedural or methodological in nature involving a comparison of pre- and post-test results with little or no attention being paid to intervening variables other than the treatment program itself. Such factors as race, sex, high school attended, college board scores, family head's educational level, chronological age, intelligence, choice of college or university, and socio-economic status are usually either not considered at all or else viewed in isolation.

RATIONALE AND PURPOSE

There have been a number of research reports which have had as their primary focus, descriptions of the appraisals of effectiveness or adequacy of sundry reading improvement programs. Investigations by Fedde, Koues, Acker, Tuckey, and Wesden may be cited as examples of studies attempting to evaluate reading improvement programs in terms of materials and procedures employed. None of these studies surveyed had examined the college-bound secondary rural student with respect to the impact, if any, of certain intervening variables on general reading proficiency.

However, there is at least one investigation which has attempted to control various intervening variables believed to affect the outcomes of secondary reading improvement programs. The study was undertaken on a limited scale in 1967 and 1968 by Johnson and Jacobson and reported in the Eighteenth Yearbook of the National Reading Conference. The present paper represents a statistically refined replication and elaboration of this initial study.

More specifically, the purpose of this investigation was to examine both singly and combinatorily, the effects of variables of race, sex, secondary school attended, college board scores, chronological age, family head's educational level, choice of college or university, intelligence, and socio-economic status on the reading proficiency levels of college-bound secondary rural students.

THE BASIC ASSUMPTION ENTERTAINED

Any observable increment in vocabulary, comprehension, or rate as evidenced by results of the *Nelson Denny Reading Test* is not a dependent function of any of the following genotypical or phenotypical variables:

A. Race
B. Sex
C. Secondary School Attended
D. College Board Scores
E. Chronological Age
F. Choice of Institution of Higher Education
G. Socio-economic Status
H. Intelligence
I. Family Head's Educational Level

THE REFERENCE SAMPLE

The reference sample, comprised of eighty-three college-bound secondary fourth-year students, was selected from six high schools representing several counties in rural Virginia. Only those students were admitted to the reading improvement program whose initial test results and cumulative record information indicated that their intelligence levels, reading achievement levels, and socio-economic divisions were distributed over the entire range of those traits and who had been admitted for the coming fall term to an accredited college or university.

Once the reference sample had been identified for participation in the reading improvement program through study of cumulative folders and prior reading achievement test scores, Form A of the *Nelson Denny Reading Test* was administered according to directions found in the manual.

That the reading improvement high school senior group was representative of secondary pupils at these age and grade levels can be seen from the data displayed in Table 1.

The mean IQ was 103 and the mean age was approximately 211 months while the mean family head's highest grade attended was grade eleven. The sample group was comprised of some 74 per cent Caucasian and 26 per cent Negro. The mean family head's occupational level was 5.21, which is somewhat below the midpoint on the Warner scale of Socio-Economic Status.

TABLE 1

Mean and Standard Deviation Reference Sample Data by Age, Intelligence, Race, and Family Head's Occupational and Educational Levels

Variable	Mean	SD
Age in Months	210.78	8.21
Intelligence Level	102.70	14.35
White	73.9	4.97
Black	26.1	4.97
Family Head's Occupation	5.21	.78
Family Head's Education	10.68	2.97

TEACHING PROCEDURES

Students in the reading improvement program were partitioned into six separate classes and participated in a series of weekly, two hour evening sessions conducted by two trained and experienced reading specialists on a rotating basis at local reading centers for a twelve week period. (The reading specialists were used on a rotating basis in an attempt to control the teaching variable). During that time the subjects received a program of instruction designed to develop, enhance, and refine their reading skills.

The teaching method employed was the same for all classes and was predicated on the concept of individualized instruction. The students were informed that the primary object of the program was to improve both rate and comprehension. The sample's main goal was to double its then current reading rate as indicated by Form A of the *Nelson Denny Reading Test* and at the same time develop and/or maintain at least 80 per cent comprehension of the material read.

In order to facilitate the implementation of this objective, the teaching methods were geared toward teaching each student on an individualized basis through the use of HILD and practice materials at each pupil's instructional level and by employing various rate and comprehension building mechanical devices including the controlled reader and the tachistoscope.

After twelve weeks of intensive instruction, the subjects were post-tested with Form B of the *Nelson Denny Reading Test.* Table 2 displays the results of both the pre- and post-testing sessions.

ANALYTIC MODE AND FINDINGS

Analysis of data was accomplished by the variance and covariance techniques of multiple linear regression. As such, the analysis involved

TABLE 2

Mean and Standard Deviation Reference Sample Data Reflecting Certain Variables Predicated on Twelfth Grade *Nelson Denny Reading Test* **Norms**

	Vocabulary in Percentiles			Comprehension in Percentiles			Reading Rate in Percentiles		
Test Form	**Pre A**	**Post B**	**Gain**	**Pre A**	**Post B**	**Gain**	**Pre A**	**Post B**	**Gain**
Mean	50.61	68.93	18.32	49.41	70.88	21.47	60.07	87.45	27.38
SD	19.34	16.09	–	18.88	12.15	–	17.61	8.42	–

the consideration of criterion and predictor variables in full and restricted regression models.

The criterion variables were the individual raw scores derived from the *Nelson Denny Reading Test* measures of vocabulary, comprehension, and rate. The predictor variables employed in writing the restricted models included the sample race, sex, secondary school attended, college board scores, chronological age, choice of institution of higher education, socio-economic status, intelligence and family head's educational level. Restricted models utilizing these variables were generated in order to test the null hypothesis.

The hypothesis that any observable increment in vocabulary, comprehension, or rate as evidenced by results of the *Nelson Denny Reading Test* is not a dependent function of any of the variables of race, sex, secondary school attended, college board scores, chronological age, choice of institution of higher education, socio-economic status, intelligence, and family head's educational level was rejected for vocabulary and comprehension at the one per cent confidence level and at the five per cent confidence level for rate.

The F ratios for the analysis of variance with covariance are displayed in Table 3 and indicate that any achievement gain in vocabulary and comprehension and rate could be attributed to difference in chronological age, race, sex, school college boards, institution of higher education selected, IQ, socio-economic status, and family head's educational level (for vocabulary and comprehension P .05 and for rate, P .03). Achievement gain in reading rate could be attributed to differences in school attended and college selected.

DISCUSSION

These data provide a number of conclusions and implications for the reading instruction of rural college-bound secondary students. The criterion variables of comprehension and vocabulary are related to those independent variables identified in this study as genotypical. However reading rate, at least at the perceptual level, as considered in this study, appears to be influenced primarily by phenotypical variables only.

TABLE 3

Analysis of the Effects on Reading Achievement in the Criterion Variables in Combination with the Enumerated Predictor Variables

	Number of Predictor Variables	F	df_1	df_2
Vocabulary Affected By:				
A. Chronological Age	16	8.17*	1	75
B. Race	15	8.27*	1	65
C. Sex	15	11.86*	1	65
D. College Boards	15	8.59*	1	65
E. School Attended	13	5.31*	4	65
F. Socio-economic Status	16	9.34*	1	65
G. Family Head's Educational Level	16	7.02*	1	65
H. IQ	16	7.05*	1	65
I. College Selected	16	14.51*	3	65
Comprehension Affected By:				
A. Chronological Age	16	9.96*	1	65
B. Race	15	9.91*	1	65
C. Sex	15	11.74*	1	65
D. College Boards	15	9.89*	1	65
E. School Attended	13	5.64*	4	65
F. Socio-economic Status	16	10.26*	1	65
G. Family Head's Educational Level	16	9.80*	1	65
H. IQ	16	7.24*	1	65
I. College Selected	16	18.65*	3	65
Reading Rate Affected By:				
A. Chronological Age	16	.86	1	65
B. Race	15	2.12	1	65
C. Sex	15	2.01	1	65
D. College Boards	15	.97	1	65
E. School Attended	13	2.99**	4	65
F. Socio-economic Status	16	1.36	1	65
G. Family Head's Educational Level	16	1.36	1	65
H. IQ	16	1.38	1	65
I. College Selected	16	2.81**	3	65

* F ratios significant at .01 level
** F ratios significant at .05 level

On the basis of this and similar studies one might gain insight into methods of manipulation and modification of perceptual attainments by focusing on those factors characterized as phenotypical in nature and function.

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Journal Literature Resources of Institutions of Higher Learning with Reading Programs

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For more than a decade there has been increasing interest in advanced education for reading teachers in the United States. An index of the professional educator's interest in reading education is the number of colleges and universities which provide graduate training in reading education either at the masters' or doctors' degree level. A report by Wilson (1967) identified a group of over 175 colleges and universities which offer programs in reading beyond the undergraduate level. Of the graduate reading education programs surveyed by Wilson, most met the minimal training standards recommended by the International Reading Association for the preparation of reading teachers and specialists. Some of the training programs also met the requirements of state departments of education for the training of specialists. Of major importance in the successful operation of these reading education programs, or any education program for that matter, are information resources. A survey was conducted to determine what journal literature resources were available in 178 institutions of higher learning with graduate training programs in reading.

A survey questionnaire was developed which listed 47 journals. The journals listed on the questionnaire were those identified by Summers (1967) as being highly productive reading research journals, i.e., journals which often reported research studies on reading. Summers (1967) developed this list of journals after analyzing and tabulating the annual reading research productivity of each journal reported and cited in the annual summaries of research on reading. The first annual summary was reported in 1925 and included 436 research articles relating to reading from the late 1800's to June 30, 1925. Each annual summary since 1925 and through 1965-66 was tabulated in this author's research. A list of the 47 journals included in the questionnaire is given in the appendix of this report.

The questionnaire was sent to a total of 178 institutions of higher learning with graduate programs in reading education identified by Wilson (1967). The survey was sent to individuals identified as directors of the reading program or chairmen of the reading department with the suggestion that the university or college librarian complete the survey. The librarians were asked to report whether each journal was available in their library. The questionnaire was in the form of a check list so the librarian merely had to place a check mark in the appropriate column. Of the total 178 questionnaires sent out, 154 or 86.5 per cent were returned.

ANALYSIS OF THE DATA

The data from the questionnaire were analyzed in two ways. First, responses from the colleges and universities were tabulated for all 47 journals. Secondly, the total list of journals was subdivided into six categories and analyzed a second time to determine the availability of the "core" journals.

For the total of 47 journals, the mean number available in the 154 college and university libraries which responded to the questionnaire was 30. The range of availability for specific journals was very wide. The *Illinois School Research Journal* was available in 11 percent of the libraries. One hundred fifty three of the 154 institution's libraries had *Elementary School Journal.* For clarification, these figures mean that only 11 per cent of the institutions with reading programs had *Illinois School Research* while more than 99.4 percent had the *Elementary School Journal.* These figures were the high and low figures for the survey.

The mean figure of 72.4 percent does not accurately reflect the large number of journals available in most of the colleges and universities surveyed. It would be more accurate to say that the majority of institutions surveyed had a majority of the journals available in their libraries. Even though the mean figures appear to be low there also appears to be a number of reasons for this. First, there was a number of low circulation journals on the questionnaire, i.e., *American Journal of Optometry* (12 percent) and *American Journal of Ophthalmology* (32 percent). There was also a number of journals included in the questionnaire which have either gone out of circulation or changed their title, i.e., *Illinois School Research* (11 percent) and *Studies in Reading* (20 percent). Finally, a number of journals which are published outside the continental United States were on the questionnaire, i.e., *Alberta Journal of Education Research* (12 percent), and the *Ontario Journal of Educational Research* (20 percent). The percent figures listed after each of the above journals indicate that these six journals were available, on the average, in only 12.3 percent of the college and university libraries surveyed. In the case of the journals published outside the United States, it is not clear why their availability figure was so low since another foreign publication listed on the questionnaire was available in 70 percent of the institutions surveyed, i.e., *British Journal of Educational Psychology*. It appears that the *Alberta and Ontario Journals* are not as widely circulated as the *British Journal of Educational Psychology.*

The data were analyzed also to determine the availability of the "core" reading journals in the 178 colleges and universities. The "core" journals are those which have published a high number of reading research reports during a given period. To analyze the "core" journals, six categories of journals defined by Summers (1967) were utilized. The six categories of journals used were the same categories used in the original analysis of the published research literature on reading. The data in this report were analyzed in this manner because from this type of analysis it was possible to determine whether universities and colleges with reading programs had the highly productive or essential journals currently available in their libraries.

The six categories of journals referred to above were defined in the following manner: Category I included seven journals which have been listed as "core" publications for four or five of the time periods mentioned. Category II included three journals listed as "core" journals for three of the five time periods mentioned. Category III listed five journals which have been "core" publications for the two most recent time periods (1946-47 to 1955-56 and 1956-57 to 1965-66). Category IV listed 18 journals which have been identified as "core" journals in the most recent period (1956-57 to 1965-66). Category V included six journals which were "core" journals for three or four periods but were not "core" journals in the most recent period. Category VI listed eight journals which had been "core" journals in the fourth period (1946-47 to 1955-56) but which fell out of the "core" status in the most recent period. The time periods referred to above were as follows: (1) 1884 to 1925-26; (2) 1926-27 to 1935-36; (3) 1936-37 to 1945-46; (4) 1946-47 to 1955-56; and (5) 1956-57 to 1965-66. Summers (1967) arbitrarily used these time periods to tabulate and analyze the published journal literature on reading.

In Table 1 the number and percent of institutions which have journals available in each category are listed. For each category the average number of institutions which have a number of the specific journals in the category is listed. In addition, the percent of the total number of institutions which have a number of the journals available and the ranges of percent of these institutions with journals in a specific category are listed.

While these figures are useful for giving some impressions of total data collected, the figures do not reveal some very specific and relevant information about the data. The remaining portion of this paper will be devoted to observations about relevant information concerning the journals in each category.

In Category I journals, most institutions (94 percent) had most of the journals. Only 13 institutions did not have the *Journal of Genetic Psychology* and *Journal of Experimental Psychology*. This figure indicates that the institutions have acquired the journals which have been producers of reading research for a long period of time.

The Category II journals were also available in most of the institutions. The *Journal of Psychology* was not available in 24 institu-

TABLE 1
Institutions Which Have Journals Available

* Category	Average Number of Institutions	Average Percent of Total Number of Institutions	Range in Percent of Institutions with the Journals in the Category
I	146	94 percent	92-99 percent
II	136	90	84-97
III	101	67	12-99
IV	106	70	11-97
V	134	80	75-97
VI	96	64	10-94

* The journals in each of the six categories are listed in Appendix II.

tions and the *Journal of General Psychology* was not available in 23 institutions.

Of the Category III journals which have been "core" publications for the most recent two periods a number is not available at many institutions. The *American Journal of Optometry* is not available in 135 institutions. The *British Journal of Educational Psychology* is not available in 46 institutions. The *Journalism Quarterly* is not available in 43 institutions. The *California Journal of Educational Research* is not available in 37 institutions. The omission of these four journals from an institution's information resources on reading may not appear to be too serious a problem unless some consideration is given to the number of research studies that a researcher would not have access to over a period of time. In the instances of the above noted journals, a researcher would not have had access to more than 190 reading research articles published in these journals during the decade from 1956 to 1966.

Probably the most important journals are those in Category IV. These journals have been "core" journals during the most recent time period. Of the journals listed in this category, three journals were not available in over 100 institutions. These are the *Alberta Journal of Educational Research* (136), *Illinois School Research* (137), and the *Ontario Journal of Educational Research.* Other journals in this category which many institutions did not have available were *American Education Research Journal* (34), *Journal of Communication* (49), *Journal of the Reading Specialist* (87), *Perceptual and Motor Skills* (49), *Psychological Reports,* and the *Reading Research Quarterly* (39). Three of these journals would be considered very serious omissions from any college or university reading information resources —the *Reading Research Quarterly, Perceptual and Motor Skills,* and the *Journal of the Reading Specialist.*

Of the Category V journals, the highest number not available at the universities and colleges was 38. *Educational Administration and Supervision* and the *Educational Research Bulletin* both were not available at 38 institutions.

CONCLUSIONS

The purpose of this survey was to determine the availability of journal literature resources at colleges and universities with graduate programs in reading. From an analysis of the data collected, it is apparent that the majority of colleges and universities with reading programs have adequate journal literature resources. However, it is also apparent that a number of institutions did not have some of the more recently published journals available. This is obvious from the analysis of the data related to the Category IV journals. A number of colleges and universities did not have either the *Reading Research Quarterly* or the *Journal of the Reading Specialist*.

IMPLICATIONS

One of the fascinating aspects of conducting this study was the opportunity to brainstorm about how this information could be utilized.

From a practical standpoint the journals listed in Appendices I and II of this report could be used to examine and evaluate any given institution's information resources on reading. The journal listed in Appendix I could be compared with the institution's current journal holdings to determine the overall adequacy of reading journal resources. The journals listed in Appendix II could be used to raise more specific evaluative questions about those journal resources. For example, a question could be raised whether an institution has the "core" journals.

It also seems at this point in time that a great deal of information on reading is available and is disseminated effectively through the published journal literature. It seems also that each institution that has the resources should give consideration on how the information on reading could be systematically organized, disseminated further, and applied. The first process—that of organization, very possibly could be the simplest since it could almost be mechanical. The final process—that of applying the findings of research to school practice—would be the most difficult, but it is also the most crucial.

Another aspect of this study that has some implications for reading education is that the data from this study seem to indicate that there exists an "invisible" information network in reading. It also seems possible that through this "invisible" information network some comprehensive and effective information analysis projects could be conducted at the national, state, and even the local level. The available research could be analyzed and interpreted. Interpretations in this instance could be developed for different audiences and for different levels of sophistication among such audiences.

Finally, the information analysis projects could in turn be effectively disseminated through the same "invisible" information network. Through such dissemination efforts the information in research reports and journal articles could be applied to school practice. This then could be the summum bonum of information dissemination—converting well tested ideas into effective classroom practice.

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APPENDIX II

Journal Literature Survey

Elementary School Journal
Journal of Educational Psychology
Journal of Educational Research
Education
Journal of Applied Psychology
Journal of Genetic Psychology
Journal of Experimental Education
English Journal
Journal of General Psychology
Journal of Psychology
American Journal of Optometry & Archives of American Academy of Optometry
British Journal of Educational Psychology
California Journal of Educational Research
Elementary English
Journalism Quarterly
Alberta Journal of Educational Research
American Education Research Journal
American Journal of Mental Deficiency
Child Development
Exceptional Children
Illinois School Research
Journal of Abnormal and Social Psychology
Journal of Communication
Journal of Developmental Reading
Journal of Reading
Journal of the Reading Specialist
Journal of Speech and Hearing Disorders
Perceptual and Motor Skills
Ontario Journal of Educational Research
Psychological Reports
The Reading Teacher
Reading Research Quarterly
Public Opinion Quarterly
School Review
School and Society
Educational Administration and Supervision
Educational Research Bulletin
Journal of Experimental Psychology
Peabody Journal of Education
Studies in Reading
Educational and Psychological Measurement
Journal of Consulting Psychology
College English
American Journal of Psychology
American Journal of Ophthalmology
Journal of Social Psychology
Language Arts and Fine Arts Review of Educational Research

APPENDIX III

Journals Appearing in Each of the Six Categories

Category I
Elementary School Journal
Journal of Educational Psychology
Journal of Educational Research
Education
Journal of Applied Psychology
Journal of Genetic Psychology
Journal of Experimental Education

Category II
English Journal
Journal of General Psychology
Journal of Psychology

Category III
American Journal of Optometry and Archives of American Academy of Optometry
British Journal of Educational Psychology
California Journal of Educational Research
Elementary English
Journalism Quarterly

Category IV
Alberta Journal of Educational Research
American Education Research Journal
American Journal of Mental Deficiency
Child Development
Exceptional Children
Illinois School Research
Journal of Abnormal and Social Psychology
Journal of Communication
Journal of Developmental Reading
Journal of Reading
Journal of Reading Specialist
Journal of Speech and Hearing Disorders
Perceptual and Motor Skills
Ontario Journal of Educational Research
Psychological Reports
The Reading Teacher
Reading Research Quarterly
Public Opinion Quarterly

Category V
School Review
School and Society
Educational Administration and Supervision
Educational Research Bulletin
Journal of Experimental Psychology
Peabody Journal of Education

Category VI
Studies in Reading
Educational and Psychological Measurement
Journal of Consulting Psychology
College English
American Journal of Psychology
American Journal of Ophthalmology
Journal of Social Psychology
Language Arts and Fine Arts Review of Educational Research

Language and Critical Reading: The Consummate Reader

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> Reading is "the most striking and important artificial activity to which the human race has ever been moulded."
> "To completely analyze what we do when we read would be almost the acme of a psychologist's achievement for it would be to describe very many of the most intricate workings of the human mind as well as to unravel the tangled story of the most remarkable specific performance that civilization has learned in all its history."[1]

This presentation is a speculative exploration of critical reading viewed as the supreme achievement of the consummate reader, the reader who is mature, intelligent, sensitive, versatile, and highly conscious. Seen in this light, critical reading is a very complex psycholinguistic process; the consummate reader is the ultimate model all readers seek to emulate, and toward which all reading instruction aspires. What follows here is a broad, introductory discussion of critical reading viewed as a profoundly language-related process. The discussion proceeds by viewing critical reading processes from three vantage points.

I

The consummate reader has mastered a set of facilitating skills and abilities empowering him to comprehend, enjoy, and assess all forms and styles of printed language:

(1) in books, professional journals within his competence, magazines, newspapers, and advertisements.
(2) creative literature in such forms as fiction (novels and short stories), drama, personal essays, and poetry.

These two modes of printed language are (1) expository writing, with primary attention to information, logical argument, and clear sequential order, supported by various means of persuasion; and (2) imaginative writing, with primary attention to creative expression of emotion, developed through appropriate literary styles and forms. And while this distinction of modes is not an absolute dichotomy by any means, still, exposition tends to be more intellectual—from the head, and literature, more emotional—from the heart. To put it oversimply for the sake of clarity, exposition speaks the language of intellect, or of thought, and literature speaks the language of emotion or of experience. The consummate reader has learned to respond with

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both heart and head when he reads, while keeping a psychic distance from his own reading experience: he enters into it fully and yet suspends final judgment of its values and its worth.

The consummate reader is a sophisticated reader who brings a rich background of his own past learning and experience to every new reading task. He must be able to handle a great variety of frames of reference for different subjects: educational, cultural in both major senses of the word, historical, geographical, social, political, economic, religious, military, philosophical, psychological, professional—whatever frame of reference a given reading task requires. If he is not in command of a particular frame of reference, the truly critical reader has options: he may simply make due allowance for his ignorance, if the topic is not of major concern to him; he may remedy his ignorance by additional reading; or he may consult an authority if the need is that pressing. According to his own purpose in relation to the nature and the value of the material to him, the consummate reader knows when to skim (speed reading) and when to read deeply and carefully (variable speed reading).

Especially when he is reading the language of imaginative literature, but also when he is reading language designed to persuade, the consummate reader responds with understanding and appreciation to tonal effects of all kinds, to the sound, rhythm, and movement of language on the printed page; and to such calculated effects as satire, irony, innuendo, understatement and overstatement, exaggeration, imagery and figurative language, and to the writer's choice of words. All these are dimensions of language.

II

We have been thinking all along of the consummate reader as a model. But when did this paragon first begin to understand the complex interplay of speech, thought, emotion, and print? If he was a lucky child, long before he went to school, fond adults or older siblings held him close and read children's stories and poems aloud to him, enveloping him in warm attention and affection. This was a regular and frequent experience as soon as he could sit still for it. In this relaxed and wonderful situation, the young child could easily follow the printed text with his eyes while he listened with his ears; he may very well have taught himself to read without even knowing he was doing it. At any rate, this seems to be the story of children who come to school already having learned to read: no spelling, no phonics, no word-attack skills, no flash cards, no drill—just plain oral reading for enjoyment, with free and easy access to the miraculously talking printed page. Reading drudgery begins when he goes to school.

Although every successful reader probably has acquired an approximate notion of English spelling in relation to his dialect, adequate for reading printed English, he is not necessarily a good speller himself. It is quite possible to read well, or to compose well, and still be a poor speller. Spelling is not a high-level human activity. As an active process, all spelling does is pattern letters into single words, and very commonly single words out of context. But spelling as an active process has no place in the psycholinguistic process of reading; any reader who spells as he reads is only working his way up to naming words, a consummation devoutly to be damned.

Wendell Weaver has demonstrated that the word is not "the unit" of language or of reading;[2] and I have argued elsewhere that the English sentence is the basic unitary meaning-bearing pattern of the language.[3] Every good reader must be able to read whole sentences and read them well, with a sensitivity to the syntactical patterns he encounters in printed English, and with at least an intuitive sense of the structural (non-interpretive) intonation patterns that accompany them.[4] The reader who has such an intuitive sense probably will have developed it largely by himself, because most instructional programs in reading, so far as they deal seriously with language at all, stop with word recognition, and treat sentence comprehension as the outcome of a process analogous to stringing beads—words are simply added on to one another in finite strings. Successful readers learn to supply their own sense of syntax and linguistic intonation, occasionally with the help of a teacher whose intuitive practice transcends the methods and materials she has been taught to work with. Awareness of and sensitivity to syntax and American English intonation—both structural and interpretive intonation—are essential attributes of the consummate reader.[5]

Comprehending sentences also requires the reader to understand the place and function of each sentence in its larger context. Such questions as the following may apply to a paragraph, to a whole article or chapter, or even to a whole book. Is this an opening or introductory sentence? What specific function does it have as an opening sentence? Is this a transitional sentence? If so, from what to what? Does this sentence carry a reference or references, either to what has gone before or to what lies ahead? Are these references noun, verb, or pronoun references; do some of the adjectives or adverbs also have a reference function? Is this sentence in some way a supporting sentence? Is this sentence a concluding statement? If so, exactly what kind of concluding statement?

The successful reader must also respond intelligently to some rather involved syntax that may be found in printed English. For example, expletive constructions with *there* and *it* may confuse him, perhaps in part because in other constructions *there* may also be an adverb and *it* a pronoun. In expletive constructions, *there* and *it* have the effect of replacing the subject, but in some sentences only a skilled reader can make this transformation easily. The passage below exemplifies the importance of understanding sentences with expletive *there.* These two paragraphs are the opening of an article entitled, "Atmosphere: The Mysterious Broth of Life."

> 1. (a) During that seemingly chaotic interval between five billion and one billion years ago, *there slowly evolved* about the planet Earth *a thin gaseous envelope* capable, by virtue of the presence of oxygen, of sustaining *life.* (b) *This atmospheric integument* has been the environment in which *man has evolved* as a civilized animal. (c) One of *its* most remarkable influences has been *its* stimulus of *man's* unique capacity to question and to reason. (d) *The atmosphere* is, in fact, *a great laboratory* in which *he* was first able to observe, in colossal grandeur or in exquisite detail, practically all of the phenomena studied in the physical sciences today. (e) From earliest time *there were conundrums* in *the air* to prod the curiosity of *man* in every direction.
>
> 2. (a) Why is the sky blue? (b) What makes the stars twinkle? (c) How are the glorious colors of the rainbow hung in all their brilliance across the sky? (d) Out of the probing of human minds for the answers to these questions *there gradually developed* a knowledge of optics—a discipline that now assists us to peer outward at the fleeing stars and inward at our own intricate growing and dying.[6]

In paragraph 1, the opening sentence (a) revolves around this central syntactical pattern: *there slowly evolved.* Although common in both spoken and printed English, this expletive construction may elude the unwary reader and leave him wondering where he went astray. To comprehend this sentence, the reader must also visualize a figure of speech representing the atmosphere, and then grasp the language and meaning of a modifier containing a sophisticated parenthetical series of phrases: "a thin gaseous envelope capable, by virtue of the presence of oxygen, of sustaining life." In sentence (b), the subordinate *man has evolved* structure is not difficult to grasp, but the gratuitous cross-reference to the verb *evolved* in sentence (a) may be confusing. Again, in the closing and transitional sentence (e), the expletive construction *there were conundrums* provides the essential key to the language pattern of the sentence and so to its meaning.

Another significant point of interest in the language of paragraph 1 is the series of references, one in each sentence, to the concept of atmosphere: sentence (a), *a thin gaseous envelope,* a figure of speech; sentence (b), *this atmospheric integument,* another figure of speech; sentence (c), the possessive pronouns, *its . . . its;* sentence (d) *atmosphere . . . a great laboratory,* still another figure of speech; and finally, in sentence (e, *the air*. Another series of references includes (a) *life,* (b) *man,* (c) *man's,* (d) *he,* and (e) *man*. These references serve, among other functions, to help bind the language of the paragraph into a coherent meaning-bearing whole, well above sentence level.

Paragraph 2, after opening with a series of three forecasting questions, closes with a long transitional sentence (c); the language and meaning of this sentence hinge on another expletive *there* construction: *there gradually developed.* It is not too much to say that the reader's success in comprehending this entire article depends upon his ability to handle the expletive *there* construction embedded in fairly complex syntactical patterns. He must handle it successfully three times in the first two paragraphs, the most crucial being the very first sentence.

A later paragraph in the same article beautifully illustrates the necessity of understanding sentences that start with the expletive *it.*

> 10. (a) *It is paradoxical that,* even as we begin the exploration of inter-planetary space, our knowledge and understanding of *the ocean of air at whose bottom we live and breathe* is so limited that we cannot explain, let alone satisfactorily predict, some of the important processes taking place in this ocean. (b) *It is appropriate—and perhaps necessary—that the scientific world, which has so many of its roots in the study of the atmosphere,* give some attention to the problem of the atmosphere.[7]

The language and meaning of sentence (a) hinge upon this small structure: *it is paradoxical that,* followed by a parenthetical or interrupting clause. After the interrupter the paradox is defined. An equivalent sentence, in meaning though not in style, would be:

> *That our knowledge and understanding of the ocean of air at whose bottom we live and breathe is so limited that we cannot explain, let alone satisfactorily predict, some of the important processes taking place in this ocean, even as we begin the exploration of inter-planetary space, is paradoxical.*

The second and final sentence of this paragraph has the same basic pattern as the first: *It is appropriate—and perhaps necessary—that. . . .* In addition this paragraph presents two images—*ocean* and *roots*—that are essential to its meaning: *the ocean of air at whose bottom we live and breathe* and *the scientific world, which has so many of its roots in the study of the atmosphere.*

Far beyond grasping the language and meaning of such sentences and paragraphs as these, the successful reader of longer passages of printed English must also know how to find and follow the sequential structure in expository prose, or in fiction, the narrative sequence of events; to discover and hold in memory the most relevant facts and details, and to relate these as supporting data to the main features of an expository outline, or to the essential actions of the unfolding plot in a novel or short story. Such processes help the critical reader discover the main point of a piece of exposition, or the theme of a story or novel. Such a reader will also interpret what he is reading by bringing previous knowledge or experience to bear on it; he may thus find a deeper meaning or a richer meaning suggested implicitly in some indirect way rather than stated explicitly. Critical reading of this order also involves evaluation of the language and style of the work *as language*.

III

How then shall we define the language-related act of reading? Reading is a psycholinguistic process, deeply and doubly rooted in language and thought. Segments and units of language, and the patterns they form, may be viewed as overt data and studied objectively; but thought, however we may define it, is covert and difficult to study directly. Psycholinguistics attempts to deal with the overlap and interaction of language and thought. Even to begin to understand such a complex process as reading, we must try to sort out, define, and describe the most important psycholinguistic components and study their interrelationships. We must ask probing questions.

What is language? What is thought? What is the relationship of language and thought? If language is basically speech, how is speech related to printed language? And how is printed language related to speech? What is the nature of the interaction of speech and print? When we read, we read printed language. How is reading related to thought expressed in printed language? In sum, can we describe the complex interplay of speech, thought, emotion, and print?

Human thought must be broadly enough and deeply enough conceived so as to incorporate not only reflective and conceptual thinking, but also creative and imaginative thinking—intellective and affective thought. If for convenience we ignore their possible interaction and regard them as opposites, these two kinds of thought express, and are expressed in, the language of intellect and the language of the emotions, respectively.

Human thought is closely bound to language. Man undoubtedly shares many neurological patterns and psychological behaviors with lower animals, but on the qualitatively human level, thinking is a psycholinguistic process, known to man alone. This side of Heaven, language is the most distinctive human attribute; language distinguishes and differentiates man from all other animals on earth. Birds do not really talk, nor do bees or dolphins. Man alone has the remarkable capacity for that greatest of all human inventions, language.

How shall we define language? Language is basically and primarily speech. Speech is an intricate vocal symbol system used by men within their societies and cultures to communicate, cooperate, and interact with each other. To understand language at all, it is essential to realize that it is a system of vocal symbols, a definition in which the terms *system* and *symbols* denote key concepts. Although there are broad language universals, each language is specific to its own culture. As a chief carrier and transmitter of human value systems, language also functions somewhat as a central nervous system, coordinating the values held and cherished by men in the given culture. Man is the only earth creature who, through language, can pass from one generation to the next, the values and accumulated experience of each culture. Word of mouth is multiplied a thousandfold by printed language and the contents of libraries; the enormous import of reading is obvious for all to see.

A further word on the primacy of speech. Each individual human being, normally endowed, learns to talk long before he begins to learn to read and write. And when he does begin to learn the graphic symbol system, it is inevitably linked to speech as the primary symbol system from which the secondary graphic system is derived. And in the history of human cultures, language appears long before writing systems do. In fact, man's forms of graphic communication have generally gone through a number of successive stages, from the direct pictorial representation of messages to the eventual development of an alphabet with letters representing speech sounds, enabling us to symbolize spoken language directly. A complex culture with a rich spoken language and an oral tradition of history and literature may exist for a very long time without an alphabetical writing system. Language is basically and primarily speech; without speech, there would be no printed language.

Earlier we spoke of that special kind of thinking that qualitatively separates man from beast as a *psycholinguistic* process. What is distinctly *human* in human thought is seen to be a profoundly *language-related* process. Vigotsky thought that "meaning . . . represents such a close unity of thinking and speech that it is not possible to say whether it is a phenomenon of speech or a phenomenon of thinking."[8] Human thought may thus be conceptualized as silent speech, or inner speech; and speech, as uttered thought. Sapir regarded thinking as "an abbreviation of the speech process."[9] Silent or inner speech is subvocal; it involves only the neural pathways that lie beyond the threshold of speech, not the complex and comparatively slow musculature used to produce speech. Thus, silent speech—thought—can be immeasurably swifter than speech itself. No one has measured the speed of thought.

Printed language is, ultimately, spoken language written down, and as such it bears a relationship to the writer's thought parallel with that of speech. But the relationship is not quite that simple. Printed language, because the writer has ample opportunity to consider, reconsider, and revise, may have an even more dynamic, reciprocal connection with the writer's thought than his speech has. Consider this sequential process. The writer first "thinks" before he writes; this preliminary thinking may take minutes, hours, days, weeks, or even years if the writing task is a major one. Then he writes down the language he has been thinking, reads it back to himself silently, and thinks more about it. He may read it aloud to himself, or ask someone to read it aloud to him, in order to satisfy himself that it sounds right. There may be a series of intimate interactions between his silent, inner speech and the language he has written down; language and thought affect each other dynamically and reciprocally, over an appreciable time. Finally, the writer decides exactly what language he will freeze into the relatively permanent form of print. If he is a skillful writer, his writing will reflect all his careful thought and be appreciated by the critical reader for its excellent quality.

When the consummate reader addresses himself to this well-written printed language, he tunes in on it in order to experience a psycholinguistic process that is his own counterpart of the final language and thought written down by the author. This is the consummate relationship of writer and reader, of printed language and the psycholinguistic experience of critical reading. Louise Rosenblatt describes this relationship as a transaction between the reader and a text.[10] Although the writer *produces* the language of the text, it is the reader himself who must in effect *re-produce* the language, thought, and experience within himself.

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An Index of Syntactic Dispersion

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Studies employing methods of stylistic analysis have provided information useful in generating indirect measures on variables such as comprehension, human interest, and creativeness. The input for a stylistic analysis is message attribute data including ratios such as type to tokens, syllables to words and words to sentences, and these ratios are formed from frequency counts on a surface parsing of the constituent elements in a passage (14). The selection of attribute and/or ratios to use in a particular study has been mainly an intuitive process, and in general, ratios have been introduced, applied, and reported without benefit of proper methodological evaluation. Hence, the suggested uses for some of these ratios have over-reached their utility for research purposes.

This paper reports on a study conducted to evaluate one such message attribute index, labeled the Index of Syntactic Dispersion (ISD), a measure of the variance in strings of three parts of speech in a passage. The purposes in the present study were threefold: 1) to determine what parts of speech to include in the ISD; 2) to see whether punctuation elements should be included in the computation of ISD; and 3) to explore the predictive capabilities of the ISD.

BACKGROUND

The ISD, in its development, stems from two distinct approaches to language research. String analysis on the constituent elements in language has played a major role in studies of co-occurence and generative transformations in work conducted by Harris (10, 11, 12), Chomsky (1, 2, 3), Fodor (8) and Katz (13). In one such study, Lynch and Stolz (19) employed probabilities based on occurrence of strings of parts of speech to form a computerized parsing procedure. Subsequently, Stolz (22) applied transitional probabilities formed from a string analysis to study Markovian processes in an especially encoded set of language data. Basic to these and other studies of language is a notion that the syntactic and semantic meanings of language elements are determined more or less by the syntax of the neighboring language elements (e.g. as suggested by Harris 10).

The analysis of message attribute frequencies in stylistic analysis has played a no less important role in the study of language. In this research, message attribute ratios such as those of words to sentences, syllables to words, abstract to total nouns, and modifiers (adjectives and adverbs) to modified (nouns and verbs), have been used to generate indirect correlate measures of judgmental response state variables

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such as comprehension (4, 5, 6, 7, 9, 21), sensationalism (23, 24), human interest (17, 18) and creativeness (15). The statistical variance is another attribute score computed on attribute counts or ratios such as words, characters and modification. The variance scores may be used as attribute scores, and hence have provided independent measures of consistency in writing style.

Strings of parts of speech may be useful as predictors of judgmental response variables, such as for creativeness or human interest. The consistency of usage of strings of parts of speech is seemingly analogous to the concept of rhythm in writing style. The Index of Syntactic Dispersion (ISD) is a measure of the variance in frequencies among strings of parts of speech in a passage and this index apparently measures consistency in grammatical usage and perhaps the degree of rhythm in writing in a passage.

To form the ISD, a language sampling is parsed into its constituent elements, then counts are made to determine the number of types of strings of parts of speech, and the frequency on each type. For instance, a sampling is parsed as article, adjective, noun, verb, article, adjective, noun, and adverb, and counts are made on strings of three parts of speech. The first three words parsed as article, adjective, noun, and counted as one instance of string one. The count is advanced one word and string two is identified as adjective, noun, verb. The count is advanced to the third word and string three is identified as noun, verb, article. The count progresses word by word in this manner throughout a passage and record is kept of the count for types of strings of three parts of speech and frequencies on each type

The types of strings and frequency counts on parts of speech for the sample passage are as follows:

String No.	Type	Frequency Count
1	article, adjective, noun	2
2	adjective, noun, article	1
3	noun, verb, article	1
4	verb, article, adjective	1
5	adjective, noun, adverb	1

The variance among strings of three parts of speech in the example is

$$(8 - 36/5)/4 = .2, \text{ and, the ISD} = .2.$$

The ISD in its initial form has been applied in three studies to date and findings indicate that the ISD is a relatively sensitive measure in each of these applications, a comparison was made of the performance of the ISD with the inclusion of strings of three, four, and five parts of speech. In all instances, a correlation of .90 or above was found between the three forms of the ISD, a finding consistent with that in prior research on strings of parts of speech (22). Strings of three were selected for further use since they were relatively easy to compute and since all three forms were highly correlated.

In these applications, the ISD was computed using a parsing on eight more or less gross parts of speech, articles, adjectives, nouns, verbs, pronouns, adverbs, preposition, and conjunctions. A sophisticated parsing of additional constituents may produce a more sensitive ISD than will a gross parsing, and a major purpose in this study was to see what parts of speech should comprise an ISD.

In computing ISD's, punctuation and sentence boundaries were bridged, and this may have an appreciable effect on the size of the ISD. Stolz (22) in work with strings of parts of speech, limited computations to counts within sentences, adhering to the somewhat mystical notion that sentences are basic grammatical units with boundaries that should not be bridged. As a result, there was little chance for reoccurence of particular strings, and, little opportunity for variability in the logarithmic measure of transitional probabilities.

A second purpose in this study was to compute forms of the ISD with and without punctuation included as part of speech equivalents. In so doing, it was possible to provide some indication about potential effects of sentence boundaries within a grammatical analysis. Prior research (12) in discourse analysis has involved a study of co-occurrences of grammatical structures among sentences, but not the extension of grammatical analyses across sentence boundaries such as in the case in the computation of the ISD.

All the applications of the ISD to date have been made in studies of creativeness in writing. In these studies, the ISD was shown to be sensitive both as a predictor of creativeness judgment and a discriminator between the writing performance of high and low creative persons. Lynch and Swink (20) used the ISD to compare writing performance of high and low creative persons under varied conditions of priming and incubation. They found that syntactic dispersion was greater where passages were written by high as opposed to low creative persons under conditions of priming as opposed to no priming and incubation. Lynch and Kays (16) applied the ISD to compare writing performance of high and low creative persons under massed and distributed activity. They found that syntactic dispersion was greater where passages were written by high as opposed to low creative persons and under distributed as opposed to massed task conditions. The utility of the ISD as a predictor of judgmental variables remains to be shown, and a final purpose in this study was to evaluate the efficacy of the ISD as a predictor in correlate measures of comprehension, human interest, sensationalism and creativeness.

THE STUDY

A total of 45 written passages was used as a language corpus. This included 24 college level comprehension passages obtained from the

Educational Testing Service, and 21 passages obtained from prior research on the measurement of human interest and creativeness. A surface parsing of 42 parts of speech was made on each of the passages. Among these were adjectives, nouns, verbs, pronouns, and prepositions. An additional 16 punctuation units were considered in this parse, yielding a total of 58 elements.

To compute ISD's for all combinations of 58 elements would be an infinitely large task. A categorization was made to reduce the number of combinations and to generate combinations for input into the ISD. The ISD combinations included those computed with and without punctuation, and breakdowns within each of the classes of combined and separate treatments of function words, adjectives, verbs, nouns, and pronouns. The punctuation classes were reduced to categories of internal and external punctuation, a reduction which provided opportunity for re-occurrence of strings of parts of speech inclusive of punctuation. The categorical analysis generated 24 ISD combinations. These are presented in Figure 1.

FIGURE 1
The ISD Selections*

ISD	
1, 13	Articles, prepositions, conjunctions, adjectives, adverbs, verbs, nouns, and noun modifiers.
2, 14	Function words (articles, prepositions and conjunctions), adjectives, adverbs, verbs, nouns and noun modifiers.
3, 15	Function words adjectives—positive, comparative, superlative—adverbs, verbs, nouns and noun modifiers.
4, 16	Function words, adjectives, adverbs, verbs—intransitive active, intransitive passive, transitive helping, and gerunds—nouns and noun modifiers.
5, 17	Function words, adjectives, adverbs, verbs, nouns—proper, common, abstract, collective and abstract collective—and noun modifiers.
6, 18	Function words, adjectives, adverbs, verbs, nouns, noun modifiers— concrete, abstract and proper.
7, 19	Function words, adjectives, adverbs, verbs, all nouns (nouns and noun modifiers).
8, 20	Function words, adjectives, adverbs, verbs, nouns, noun modifiers, pronouns used as adjectives—personal, demonstrative, indefinite, neuter and relative—and pronouns used as nouns.
9, 21	Function words, adjectives, adverbs, verbs, nouns, noun modifiers, pronouns used as adjectives, pronouns used as nouns—personal, demonstrative, indefinite, neuter, reflexive, and relative.
10, 22	Function words, adjectives, adverbs, verbs, nouns, noun modifiers, pronouns used as adjectives—personal, demonstrative, indefinite, neuter, and relative —pronouns used as nouns—personal, demonstrative, indefinite, neuter, reflexive and relative.
11, 23	Function words, verbs, nouns, pronouns used as nouns and all modifiers (adjectives, adverbs and noun modifiers).
12, 24	Function words, all modifiers, all non-modifiers, (nouns and verbs).

* ISD's 13-24 include internal and external punctuation as separate grammatical units, while ISD's 1-12 are computed with the exclusion of punctuation elements. In ISD's 1-7 and 13-19 pronouns used as adjectives are coded with adjectives and pronouns used as nouns are coded with nouns.

Judgmental measures on sensationalism, human interest, and creativeness were available for all passages. Measures of comprehension were available for 24 of the passages, and computations reported for comprehension were based on scores for these 24.

RESULTS AND DISCUSSION

The results fall into two parts. In the first part a correlation matrix was computed among the ISD scores for the 24 combinations. Selected correlations are presented in Table 1. The correlations were subjected to a factor analysis to see how many different structural classes of ISD's were generated by the categorical analysis. The factor analysis is presented in Table 2.

TABLE 1
Selected ISD Correlations

ISD'S	Correlation
1-13	.56
2-14	.83
3-15	.74
4-16	.82
5-17	.59
6-18	.85
7-19	.78
8-20	.80
9-21	.80
10-22	.81
11-23	.79
12-24	.28

From the factor analysis, two structural classes of ISD's were isolated and identified. The predominant factor 1 accounted for 56 percent of the common factor variance and was designated by high factor loadings on all of the ISD's with punctuation elements and all but two of the ISD's without punctuation. Factor 2 explained 35 percent of the common factor variance and was characterized by high factor loadings in the ISD's computed without punctuation. In all but two instances, ISD's without punctuation had split but high loadings on both factors 1 and 2. Apparently, strings of three parts of speech contain some grammatical information about both the internal functioning of a sentence and how to bridge sentence boundaries.

In one of the two exceptions, function words were treated separately, and each of the other categories of parts of speech were combined. This was the only non-punctuation instance when function words were not combined, and this may have reduced their relative contribution to the ISD. Perhaps function words play a major role in

TABLE 2
Rotated Factor Matrix for the 24 ISD's

	ISD	Factor 1	Factor 2
Without Punctuation	1	.25	.92
	2	.63	.76
	3	.57	.80
	4	.73	.57
	5	.44	.84
	6	.63	.76
	7	.56	.70
	8	.63	.77
	9	.59	.78
	10	.59	.79
	11	.71	.59
	12	—.06	.88
With Punctuation	13	.92	.31
	14	.91	.34
	15	.92	.31
	16	.88	.33
	17	.72	.34
	18	.90	.37
	19	.89	.36
	20	.92	.35
	21	.89	.37
	22	.91	.34
	23	.92	.31
	24	.92	.31
Percent of Variance		55.87	35.27

the grammatical string in bridging sentence boundaries, and this needs to be explored. In the other exception, only three classes of input were included: modifiers, modified, and function words combined. In this instance there possibly was insufficient variability to accommodate information useful in bridging language boundaries, and this may account for a reasonably low correlation with other ISD's including punctuation elements.

The ISD's comprised of gross surface parsings on 5 parts of speech classifications loaded highly on the same factors as ISD's formed with more extensive parsings using as many as 17 grammatical distinctions. This finding indicates that an ISD computed from a gross surface parsing with relatively few grammatical distinctions should work as well as one computed from a more sophisticated parsing with more grammatical distinctions. Hence, the labor in performing parsings for computation of an ISD may be substantially reduced from the effort involved in coding in this study.

A comparison was made of the multiple correlations for predictions on variables of comprehension, sensationalism, human interest and creativeness with and wthout the ISD. The ISD contributed appreciably to reduction in the residual variance in the predictions for sensationalism and creativeness with T values of 3.54 and —3.46 respectively, and did not add appreciably to the reduction in variance for human interest and comprehension with T values of—.91 for comprehension and .62 for human interest. The multiple correlations are presented in Table 3.

TABLE 3
Multiple Correlation Analysis

Judgmental Variable	Multiple Correlation Without ISD	Per Cent of Variance	Multiple Correlation With ISD	Per Cent of Variance
Sensationalism	.59	35	.70	49
Creativeness	.57	32	.67	45
Comprehension	.48	23	.51	26
Human Interest	.83	69	.83	69

CONCLUSIONS

In this study, only a few of the large variety of parts of speech have been examined on a limited language corpus, and this study needs to be expanded on a more extensive basis. The ISD would seem to have major consequences in the area of language translation and information retrieval as well as stylistic analysis. To apply the ISD as a research index, we recommend the ISD be comprised of parts of speech coded as follows:

1. Function Words
2. Adjectives
3. Adverbs
4. Verbs
5. Nouns
6. Noun Modifiers

This particular form of the ISD loads highly on both of the two factors of ISD structure in the factor analysis, and does not require an extensive or sophisticated parse.

The ISD promises to be a useful addition as a research strategem for evaluating language samples, but it is not the end of all such research efforts. In conducting the research on the ISD other possibilities emerged which may add to the independent measures of message style. One in particular seems especially useful, labeled the index of syntactic amplitude (ISA). The ISA is computed as the variance in word units between the re-occurrence of a string of three parts of speech. Both the ISA and the ISD are being used to evaluate communication performance in studies currently in progress.

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Personality Differences and Learning Styles in Reading

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Intuitively, classroom teachers can often point out particular learning styles that seem to match various personalities. The personality concept, Internal-External locus of control, has been utilized recently to clarify a teacher's intuition regarding the learning environment and personality orientation by Mathis, et al. (4) and Mathis and James, (5). Internally oriented students have been characterized by Lefcourt (3) as perceiving events in their environment as being a consequence of their own action and thereby under personal control. Thus, an internally oriented student might view his approach to reading skills and the learning environment in a different light from that of an Externally oriented student. External personality orientation supposes that an individual views the reading process as unrelated to his actions and therefore beyond personal control (i.e. due to fate or luck). Providing that the Internal-External concept discriminates personality differences James (1) and James (2), it follows that these students might require different learning environments to achieve maximal performance. Often, it is not difficult for classroom teachers to discriminate these attitudes towards the reading process.

Two obvious learning environments are suggested from the Internal-External concept. It has been noted that Internals seem to function well without guidance (liberal environment) and direction, whereas Externals seem to require more structure and authority (structured environment). Since previous research has indicated the Internal-External control concept is an important variable in predicting reading improvement several hypotheses were formulated:

(1) It was predicted that Internally oriented students placed in an Internally oriented environment (liberal setting) would show greater reading improvement than if placed in an Externally oriented environment.

(2) It was generally predicted that progress in reading would have more pronounced effects when personality and environment were similar than when dissimilar.

METHOD

Subjects:

Forty ninth-grade male students who fell into the average range of intelligence (Lorge-Thorndike) were utilized as participants. An additional factor was that their general reading ability was within three grade levels of ninth grade. Subjects were selected as Internals or Externals based upon scores obtained on the James I.E. Scale. All students involved expressed interest in participating in a course in reading improvement.

Design:

Subjects selected were assigned to one of four experimental subgroups containing 10 subjects each. These subgroups were designated as follows: Group 1, Internal personality in a liberal or internal learning environment; Group 2, Internal personality with structured or External environment; Group 3, External personality with Internal environment; Group 4, External personality with External environment. The dependent variable was reading rate and performance measured by the Reading Eye photographs.

The Internal-External conceptual framework was extended into the liberal vs. structured terminology more familiar to teachers. Utilizing a multi-media approach to reading (adaptation of EDL R-300 program) the Internal-External teaching environments were created. The Internal environments were created. The Internal environment group became involved in the programmed materials designed to be as fully student-controlled as possible. Progress on all phases of the program, such as training with instrumentation, was made entirely dependent upon the subject. The External environment group received training in reading development, and all activities and directions were given in such a manner as to make all activities appear as fully teacher controlled as possible. Control of all phases of instruction was closely supervised by the teacher. The reading course was conducted for a seven-week period, five days a week. Content included perceptual accuracy training, controlled reader activity, vocabulary development, and novel reading.

Tests of progress were the same for both the Internal and External environment groups. Pre and post measurements were taken on the Reading Eye Camera as to the changes in number of fixation, reading efficiency, and regressions.

RESULTS

Reading performance refers to gains made by students in basic measurable criterion variables such as fixations, regressions, and rate of reading with comprehension. Table 1 presents the pre-test and post-test results obtained on film. Data provided by the eye movement photographs are supportive of the hypotheses.

Present eye movement photographs will be compared with normative data gathered by Taylor (1960). Examining the first rows in Table 1, it is evident that the greatest change with regard to reducing the average duration of fixations was gained by the Group 1, Internal-personalities in the Internal environment. Group 3, External personality in the Internal environment, demonstrated least change in average duration of fixations with the remaining two group's per-

TABLE 1
Reading Performance Progress Using Pre and Post Data As Measured by Eye Movement Photography

			GROUPS						
Measures		**S.D.**	**Ip-It**	**S.D.**	**Ip-Et**	**S.D.**	**Ep-It**	**S.D.**	**Ep-Et**
Average Duration	Pre	2.74	.27	2.82	.27	2.88	.27	2.70	.27
of Fixation	Post	2.21	.24	2.71	.25	2.68	.26	2.27	.25
Fixation per	Pre	17.22	142	16.81	143	17.85	140	17.00	143
100 words	Post	8.76	68	10.98	85	11.31	113	9.32	88
Regressions per	Pre	10.10	23	11.00	22	10.66	23	10.87	22
100 words	Post	5.12	15	10.69	18	10.13	21	8.76	19
Rate With	Pre	8.76	155	9.31	160	9.21	155	9.30	160
Comprehension	Post	13.41	360	21.22	310	19.33	200	14.01	305

formance being the same. Taylor (1960) suggested in his standardized chart of such variables that if a program in reading improvement was successful, then a person's duration should show definite change to durations toward the range .22-.25 seconds. The post score of .24 duration time is equivalent to an average college student's performance while .27 is standard for ninth grade boys.

As fixations per 100 words are examined in the second row of Table 1, it is observed that Group 1 showed the greatest advance in decreasing the number of fixations. This level of achievement is superior college functioning. Group 3 progressed from a fourth grade level of fixations to an eighth grade level while the remaining groups achieved a medium college level.

The greatest reduction in number of regressions per 100 words appear within Group 1, closely followed by the Groups 2 and 4. Group 3 advanced from a seventh to eighth grade level but did not have the same success as the other groups in the study.

A fourth component of the reading progress measured was the rate with comprehension. All groups improved, but only groups 1, 2, and 4 made impressive gains when compared to Taylor's normative data. While college students in Taylor's normative sample had an average reading rate of 280 words per minute, groups 1, 2, and 4 raised their reading rate beyond this level.

Examination of standard deviations obtained for all measures of reading progress shows greater post measurement variability for those subgroups with dissimilar personality and environment orientations. This observation is best illustrated by observing the standard deviations on the post measure for rate with comprehension. Group 2 shows a particularly high variability in rate and may reflect the inappropriate external learning environment.

Generally, the assessment of progress supports the hypotheses. Group 1 and Group 4 did appreciably better in the congruent learning environment that in the dissimilar setting. It is also noted that virtually no performance differences exist between Groups 2 and

3. These results tend further to support the hypothesis that the congruent personality-environment situation provides better reading performance and progress than an incongruent setting. As reflected from Table 1, this result seems particularly relevant for the External personality who depends on structure and authority.

DISCUSSION

Supporters of programmed instructional materials such as used in the study usually assume certain motivational and intellectual components to be inherent in the multi-media center. The learner is reinforced by emitting correct responses, being taken up with the mechanics or some other material related variable. However, the rewards of the programmed learning situation may be related to individual differences in personality and may contribute substantially to the effectiveness of programmed instruction. The present investigation sought to establish the effects of individual personality differences using the Internal-External personality concept upon performance in the External and Internal environment.

Some discussion seems required to examine the significant effects of the Internal-External personality variable and the significance of the Internal-External environment. The Internal personality attained the greater performance gains, although all groups improved considerably. The External personality functioning in a very liberal, unstructured environment with the multi-media materials achieved an unusually small amount in comparison with other groups.

The above finding concerning poor achievement of the External personality may be important to both educators and publishers. Educators are aware that the child who depends on outer-controls for learning cannot function well without structure, and this study seems to provide an indication of the quantity difference between the External personality in both the liberal and structured setting. The present study also demonstrated the versatility of a particular approach to reading in that both extremely structured and extremely liberal environments could be created using identical materials. It is of further importance to publishers and teachers of poverty children, who are often External personalities, that the new trend of unstructured classrooms may not be as appropriate as first thought.

An observation about these personalities within their particular environment is interesting. Internal students in the unstructured program managed to participate in at least 75% of the total program each period. The Externals in the same unstructured setting managed only to participate in an average of 32% of the programs each period. In fact, the members of this group appeared to have considerable difficulty shifting from task to task. They appeared more rigid and needed to be reminded more often at the end of each week to maintain some balance of activities. The groups in the External setting covered 75% of the total programs available, but the experimenter controlled this element exclusively.

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Effects of Practice and Learning Strategies on Speed of Scanning for Phrases in Meaningful Material

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General interest in eye movements particularly those involving scanning has heightened in the last few years with the development of new devices to measure eye movements—e.g. the Mackworth camera, the new Reading Eye Camera, and the eye movement monitor (developed by Space Sciences, Inc.), and renewed interest in and development of more sophisticated theories of auditory and visual perception as they relate to short term memory. (Sternberg, 1966, Massa, 1967)

As Thomas (1968) describes it, to look closely at something one must turn one's eyes so that the image falls directly on the fovea, a specialized high cone region smaller than the head of a pin that lies in the center of the retina. In man, only in this tiny region are the receptor cells of the retina sufficiently dense to provide detailed vision. As a result, not more than a thousandth of the entire visual field can be seen in "hard focus" at a given moment. Yet the human eye is capable of dealing with a scene as complex and changing as that which confronts one while flying an airplane or driving an automobile in traffic. These complex visual tasks can be accomplished because the eyes are able to flick rapidly about the scene with the two foveae receiving detailed images first from one part of the scene then another.

These eye movements and fixations have been recorded and superimposed on actual scenes through motion picture devices and these have been applied to such varied uses as designing highway signs, radar displays, judging critical details on an x-ray plate, etc. In many laboratories, such methods to study how the human eye attacks visual problems are used.

The saccade is defined as the rapid jump as the eye moves from one fixation on one part of the scene to another. The speed of the saccade depends on its length and direction and also differs from individual to individual. The movement the eyes make may be straight, curved or even hooked, but once the eye is launched on a saccade it cannot change its target. The eye moves frequently and rapidly so that the patterns can be recorded only by instruments. In analyzing the eye movements of pilots or drivers, it has been observed that the eyes often seem to shift aimlessly, interpreted by some as readiness to react visually to the unexpected. Human engineers have been concerned with the panel arrangements for instruments so that they could be seen and identified quickly by the pilot. This research has helped reduce the two leading causes of aircraft accidents—misreading instruments and operating the wrong control.

In reading, as in driving an automobile, the saccade is the predominant eye movement, but in reading it is initiated in a different way. When one gazes at a line on a printed page only three or four words can be seen distinctly. If every word on the line is to be read, the eyes must jump two or three times, and the frequency with which they jump depends not only on the reader's ability to process the visual information, but also on his interest in what he is reading. So the reading saccade is initiated not so much by the image on the periphery of the retina as by a decision made within the central nervous system. Fixation times increase as the material becomes more difficult to comprehend. Regressions, etc. are involved. When people of occidental cultures read, they move their eyes from left to right and top to bottom and they usually look first at the upper left-hand part of a page. Sometimes if the page is broken up as a newspaper is with pictures, this pattern does not hold. When one examines eye movements in pictures or groups of pictures, scanning patterns appear highly individualistic. Though consistent, there are no preferred sequences in the areas which are inspected. In viewing pictures, the order of visual fixations typically follows the borders whether subjects are looking at Rorshach blanks, or pictures of attractive young ladies, or x-rays of the chest. (On the x-ray studies, medical students carefully examine the edges of the heart and the margins of the lung fields but left large areas uninspected.)

Because visual scanning behavior is affected by emotion (a number of studies have shown that people tend to avoid accepting and remembering visual information that is associated with heightened emotion), visual scanning techniques have been used in studying personality characteristics, learning styles, etc. They have also been useful in studying the effects of drug usage.

Hess (1965) found that when an observer's interest is aroused his eyes move more often, there are fewer eye blinks, and the eyes are open wider and the pupils are dilated.

MENTAL PROCESSING AND UNCONSCIOUS SEARCHING

Mackworth (as reported by Thomas, 1968) and others reported a phenomenon termed "looking without seeing" where subjects were given the task of finding one number among a matrix of numbers. Eye movement records revealed that although at times a subject was actually fixating on a number he was seeking, it did not register and he would continue the search. That there was some recognition of the number at some level was indicated by the variation in scanning pattern, however, the subject was not consciously aware that he had found what he was seeking.

SCANNING CUES (MEANINGFULNESS)

Krueger (1969) investigated subjects' use of cues in "word patterns" in redirecting their search for target letters in a scanning task. He hypothesized that the "information or redundancy embedded in real words" would increase the speed in locating target letters. He found that subjects located letters in words faster than in non-words although the number of errors made did not differ significantly. In a second experiment, Krueger (1969) found that subjects searched faster for target letters and made fewer errors when coherent sentences were presented than when words were scrambled. In both of these experiments subjects searched displays in which target letters (those searched for) were not present. When target letters were present in the display, the time saving for words was *not* increased, suggesting that the main advantage of using words over non-words lies in the stimulus input stage rather than in memory comparison factors.

PATTERNS OF SCANNING BEHAVIOR

Gardner et al. (1961) reported that individuals are consistently different in scanning behavior when asked to make decisions about relationships between stimuli. This study involved relating personality measures and other variables to cognitive style. A relationship between "extensive and limited scanners" and response time on the Rorshach was reported, and it was concluded that there are "syndromes of scanning behavior" rather than unrelated bits of skimming behavior. In a selective attention task (three letter words were presented with spaces between the letters vs. three letter words with extraneous other letters instead of spaces), it was found that field articulation skills predicted performance on the difficult word reading task.

Moore (1962) studied scanning behavior in reading and concluded that subjects who skimmed had consistent but highly idiosyncratic techniques and patterns and that those who were anxious, emotional types (according to a group-administered Rorshach) were unlikely to be able to learn to skim.

Relationships between speed of recognition, visual tracking, personality traits, and cognitive style have been investigated using scanning as an independent variable. (Note: one of the most ambitious projects, that of Messick at ETS involving the relationship between scanning and cognitive style has yet to be completed.)

SCANNING AS A READING SKILL

Although college-adult reading courses typically include techniques for skimming and scanning as a "higher-level" reading skill, little systematic research has been done on the characteristics of students who can learn these skills and methods by which they can be taught with the single exception of the work by Moore, cited above. Typically, skimming is defined as a technique for getting the main idea or gist of a selection quickly and scanning as the skill involved in locating specific facts.

Recently a number of publishers have produced visual tracking exercises which resemble the scanning behavior studies reported by psychologists studying short-term memory since they involve locating letters in a matrix, or counting the number of times a single letter appears on a film strip, or circling the letters of the alphabet in sequence when they are embedded in nonsense words.

DESCRIPTION OF THIS STUDY

The purpose of this pilot study was to investigate the following questions:

1. To what extent can scanning speed be improved through practice?
2. What learning strategies do students use in attempting to improve their scanning? Which are the more effective strategies?
3. Are there differences between scanning rate when stimuli are presented orally vs. visually?

Subjects were advanced college students with average reading skills (i.e., below 300 words per minute on the Reading Versatility Test with 70% or higher comprehension). Each subject was either auditorially or visually presented with one of three phrases (i.e., "when you hear the bell . . . buzzer . . . or click") and instructed to fix this "target phrase" in his mind. Then he was presented with a page of single-spaced typewritten context and instructed to run his eyes quickly down the page, locate the target phrase, and read the rest of the sentence which would instruct him to push either a red, yellow, blue or white button. He would then push the appropriate button on the panel located in front of him. The target phrases were randomly embedded in the 600 word passage presented, and each subject was given 80 trials. The experimenter recorded the time it took for the subject to locate the target phrase and make the appropriate response. A mean time score per line was computed for each trial by dividing the total time it took to emit the appropriate response by the number of lines scanned. (i.e., if s took 22 seconds to locate and respond to a phrase which appeared on line 44, his mean time score per line was .50 sec.) Trials in which the subject averaged .75 seconds per line or longer were considered "misses" since this was equivalent to 800 words per minute or slower, and it was assumed that at such speeds the subject was doing more reading than scanning or had time to go through the passage more than once.

The cut-off score of 800 words per minute for scanning was arbitrarily chosen, based on generally accepted eye-movement studies such as that described in a 1969 Educational Developmental Laboratories Report on norms for the Reading Eye Camera which states that of 40,000 persons tested on the camera, only 3 were found to read faster than 800 words per minute.

At the end of each trial, the s was instructed to report the strategies he used, which he found most effective, and to make other comments about specific trials on which he had difficulty or panels that he had to reread to find the target phrase.

RESULTS

Figure 1 shows the performance (mean time per line per trial) on sample trials for three subjects. Although all subjects showed im-

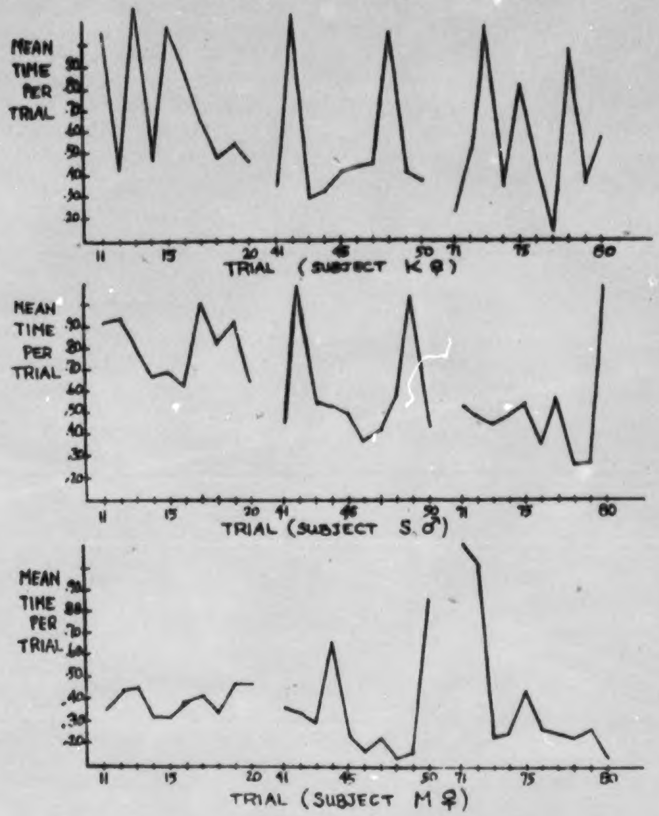

FIGURE 1
Performances of Typical Subjects on Individual Trials

provement, each profile was different revealing individual characteristics (e.g., Student K showed wider fluctuations in performance from trial to trial since she was taking risks and attempting to "psych" out the part of the page where the target phrase might appear and started her scanning at different points on the page while Subject S was more cautious and tried to avoid going through the page twice. Subject M hit on a satisfactory strategy by Trial 11, and though she continued to make good progress, missed on some later trials when she tried to improve her strategies.)

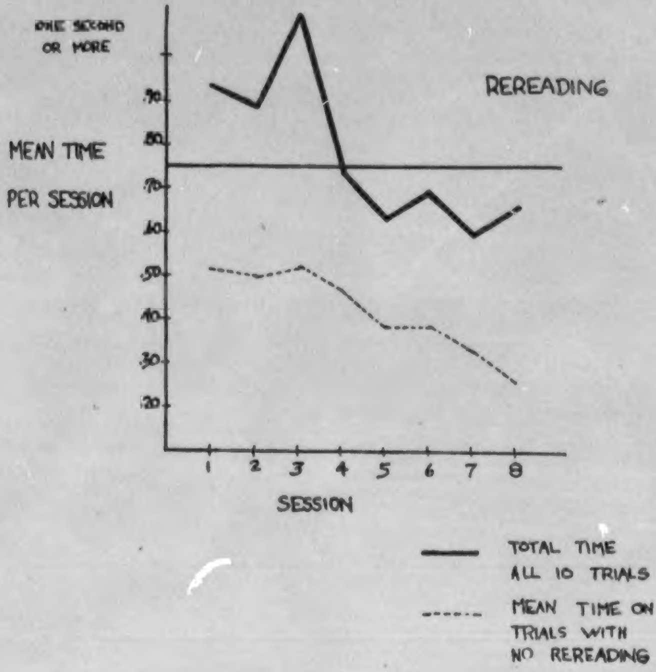

FIGURE 2
Composite Mean Time Score for All Subjects (N = 4)

Figure 2 shows the composite mean time scores for all subjects on each session of 10 trials. The top line in the graph shows the mean rate per line scores including re-scanning (missed trials) and reveals that the group averaged speed gains of 30 percent between the first and eighth session.

The lower dotted line in Figure 2 shows the mean times per session based only on successful trials (i.e. those where speed per line averaged better than .75 second). The group attained a 54 percent increase in speed over the eight sessions (80 trials). On the eighth session, students "missed" one to three trials but attained far faster rates in scanning and correctly identifying target phrases. Errors, defined as making an incorrect response by pushing the wrong colored button, were exceedingly few—less than one percent of the total responses made.

No significant differences were obtained between mean scanning times when stimuli were presented orally or visually for the group as a whole though some students indicated they preferred one mode of presentation or the other.

ANALYSIS OF LEARNING STRATEGIES REPORTED BY SUBJECTS

List of strategies attempted but rejected by students:

1. Looking for sentences beginning with "When" (this strategy was often ineffective because "when" appeared frequently on some panels.)
2. On sessions where the context was the same on each trial, looking at the total panel and trying to remember which paragraph was longer. (This was usually quickly rejected since it did not work.)
3. Running one's eyes down the left side of the page. Other students hugged the right side of the page. (When they missed the sentence with this technique they then shifted their visual position.)
4. Looking for any part of or the total phrase.
5. Starting at different points on the panel (i.e., at the top, center or bottom.) Sometimes this strategy worked through luck but subject missed many phrases.

Strategies which students felt were beneficial:

1. Running eyes down the center of the page, using fingers on both edges to make sure that the eyes moved across on both sides, trying to increase peripheral vision.
2. Repeating mentally the work "push" and looking for it.
3. Looking for the configuration for the signal (a "11" for "bell," "zz" for "buzzer," and "ck" for "click"). This worked very well for one student except on panels that had several double "1" words interspersed in the text.
4. Looking for color (this seemed to be the optimal approach for at least one student who alternated between that and searching for the word "push".)
5. Dividing the page into rectangles and scanning diagonally (one student reported this was his preferred method.)

In general, fixing part of the phrase, i.e., "push," looking for a "color" and mentally repeating this over and over seemed to be the preferred strategy. Some subjects using a "z" method pattern or attempted to move eyes down the center while their hands moved down both margins of the page.

CONCLUSIONS

All subjects tested improved their scanning speeds between initial and final sessions (i.e., first ten and last ten trials). The total group averaged 54 percent reduction in mean scanning time per line in correctly locating target phrases on one scanning, thus they were dealing with an average of approximately 1380 words per minute on the last ten trials.

In attaining faster scanning speeds, each subject developed different strategies for learning the task (i.e., used different cues, reported trying different eye-movement patterns, etc.), yet scanning time profiles on successful trials tended to be quite consistent for each individual throughout the experiment. This finding supports the results reported by other investigators (Moore, 1962, Thomas, 1968, Gardner et al., 1961.)

No significant differences were found for the group between scanning speeds and method of presentation of the stimulus (i.e., auditory vs. visual presentation). This is consistent with the results reported by Elliott (1969) who found that reaction times for auditory vs. visual stimuli showed no differences when adults were tested although modalities of presentation did affect the reaction times of children tested. Another factor that might account for the results in the present study is how the subject interpreted the direction to "fix the phrase in your mind." Some reported mentally repeating the phrase or some key word while others appeared to visualize the word or parts of it and scanned for configuration cues regardless of whether the stimulus was presented orally or visually.

Although the present study demonstrates that scanning rates for locating phrases in meaningful context can be improved, the question of whether this skill will transfer to regular reading skills remains unanswered. Further research is needed to determine its applicability to improvement in rate and to comprehension of more complex materials. Some subjects reported that participating in the experiment seemed to affect their reading rates and made it easier for them to locate relevant information in their college reading assignments but systematic investigation of transfer effects is needed. Furthermore, in this study, eye-movement strategies were based on self-report data, and studies controlling on visual acuity and eye-movement photography would provide a more objective measure for analyzing strategies that lead to improvement.

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The Opinions of Thirty-Three Disadvantaged Vocational High School Students Regarding Adjustment Subsequent to Remediation in Reading

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A total of 184 students was enrolled in the writer's reading classes between September, 1958, and June, 1961. Among these were five who had transferred out of school, seventy-seven who were still in school, fifty-one who had dropped out, and an equal number who had graduated. Of these, only dropouts and graduates were studied to allow for longer term follow-up. Thirty-four dropouts and thirty-three graduates were accessible and available for participation in a study designed to determine how effectively the program of remedial reading instruction had served their needs in and outside of school. This paper will be limited to a consideration of the characteristics of the graduates and their perceptions and opinions regarding personal, academic, and vocational adjustment subsequent to remedial reading instruction.

Among these graduates, twenty-two were White and eleven Negro. All were American born and male. There were eight whose fathers had died prior to or during their high school education, one graduate who was living with foster parents, and three who were married. The rest were living with both parents.

Approximately half the parents were high school graduates, three had attended college but had not graduated, the remainder had completed their elementary school education. Occupations of the fathers were mostly distributed among a variety of skilled labor: machinists, electricians, auto mechanics, and bricklayers. About one-fourth were working at unskilled labor—truck drivers and porters. Three were civil service employees. None were engaged in professional proprietary or managerial pursuits.

The median intelligent quotients of these students was 79. The group intelligence tests were heavily weighted with verbal material and can hardly be considered valid in the light of the graduate's reading retardation which averaged more than five years.

An examination of their elementary and junior high school records showed that seven had been enrolled in classes for slow learners and two had been labeled as mentally retarded. Most of their grades prior to entering high school were satisfactory. While in high school, the majority passed all subjects although their grades were seldom higher than 75 per cent. Five graduates had remained in school an extra term in order to make up subjects they had failed to pass. The subjects which were most frequently failed were science and mathematics. Possibly this failure reflects the fact that textbooks in this area of knowledge are difficult to read because of their technical terminology. No student failed English. One reason may be due to the fact that some of the most severely disabled readers whom one might expect to fail a regular English course were enrolled in remedial English classes prior to graduation. These classes were small and offered differentiated, individualized instruction commensurate with the pupils' ability level.

An inspection of the dean's files indicated that not a single graduate had committed any serious disciplinary infraction during his stay in school. In looking over their high school records, one is impressed with the generally satisfactory nature of their school adjustment.

Why They Remained to Graduate

In view of the fact that reading ability plays such a prominent part in one's successful academic adjustment to high school, the question arises why this group of thirty-three students, all of whom were markedly deficient in reading ability, managed to graduate from high school. All of the graduates who were interviewed said that despite their reading handicap school was a satisfying experience. They liked school in general, and certain subjects like shop and reading in particular, as these comments reveal: "I found that I knew what I was doing in shop. It related to what I was going to do after I got out." "I drove myself after I improved my reading in those courses I didn't care for."

Friendly, helpful, and considerate teachers motivated several of the graduates to experience a personal sense of satisfaction in their studies as this comment indicates: "They made me feel that I could do the work. Some coached me when I needed it."

Good marks and a satisfactory citizenship record led several graduates to remark that school was easy enough to finish. Some were reluctant to quit school because they couldn't "let the school down." Their presence on the track and basketball teams was deemed essential.

Another reason which contributed to satisfying experiences was the friendly attachment which several had formed with their classmates while working as a representative of the student government, singing in the chorus, participating in the sports events, or working on the school newspaper. The most frequent reason given for graduating was the desire to improve their vocational prospects. A typical comment in this regard is the following: "I wanted to get a good job and have security in it. The more reading and arithmetic I learned, the better would be my chances. You need a diploma to get the higher paying jobs."

Two graduates had plans to go to college. A high school diploma would, they thought, enable them to enter. Another graduate realized that he needed as much knowledge as possible to be a useful member of the clergy.

Family pressures and expectations stimulated some to graduate: "My family and relatives coaxed me to remain when I felt like dropping out." "All my cousins and brothers graduated. My mom would be proud if I graduated."

Other reasons mentioned for persisting in high school until graduation were strong drive, desire for success and prestige, and confidence in their ability to succeed despite a few set-backs. The reasons which the graduates gave were often interrelated. All gave at least two or more reasons for remaining in school. Whether these were rationalizations or not is difficult to determine.

Remedial Reading Instruction and Schoolwork

In order to find out what effect reading instruction may have had on their academic adjustment while in school the writer asked the graduates these questions, "Did you notice any change in your attitude toward school which may have been associated with help received in the remedial reading class? Explain."

Among the unqualifiedly affirmative responses of twenty-five graduates were comments such as these:

Changed attitudes toward reading and learning. "My reading improved. I wanted to remain in school. Without it I would have quit. I began to understand my homework when my parents helped me." "I had more confidence in myself and I knew what my problem was and I would go over my mistakes to improve them." "After I left the reading class I wanted to push myself harder because I felt I could do better. I felt important. The teacher looked up to me because I knew more."

Changes in performance and participation in classes. "I got better marks because I could understand more of what I read. I also took a more active part in class discussions." "I could study better and remember what I read because I learned the right techniques." "I felt more relaxed in my other classes and wasn't afraid to read out loud." "I understood my homework better and got through faster. I could keep up in my other classes."

Two graduates who had reservations about their improvement traced their increased comprehension of what they read to techniques learned in the reading classes. However, they felt that being in the reading class had not affected their attitude toward school either negatively or positively. Two graduates who had negative reactions to remedial reading instruction believed that what they had learned did not help them to do better work in their other classes: "The reading class didn't help me with my history class which was still too difficult. I was not interested in school. I didn't feel reading was important." "I was very depressed with my reading. I didn't seem to be making much progress in my other classes and felt like quitting." Four graduates believed that being in the reading classes made no difference. "I could take it or leave it."

In order to ascertain additional information concerning the graduates' thoughts about their academic adjustment subsequent to remedial instruction as compared with what it was prior to receiving instruction in remedial reading, the writer read eight questions, each referring to some salient aspect of school adjustment: textbook comprehension, interest in school work, participation in class discussion, performance of homework assignments, willingness to do voluntary work, time devoted to study, school marks and effort. Their responses were recorded and tabulated.

The majority of graduates reported receiving higher grades, spending more time studying, showing more effort and interest, and participating more frequently in classroom discussions.

Of special interest is the information that although 32 graduates reported that they could read their texts with more understanding after leaving the reading classes, only one felt that with regard to textbook comprehension he was "well adjusted." Twenty-one of the former students reported that they had failed to show any willingness to do voluntary work (over and above what they were required to do). On matters relating to the performance of homework assignments all responses indicated improvement; twenty-one responses were in the "well adjusted" category.

Remedial Reading Instruction and Personal Adjustment.

Some typical comments made by the 27 graduates who associated changed perceptions about themselves and others subsequent to spending one or more terms in the reading classes were these:

Self-development and self-realization. "I felt I could do as well as the next person. I felt better because I could follow what other kids could read." "I became more relaxed. I could discuss my problems without fear. I knew what I was going to say and how to say it." "I became more aware of my weaknesses and took more interest in improving myself and making a better impression on others."

Feelings about others. "When I read more I could talk better with others because I had things to say and this helped me to make friends." "I wanted to meet people at parties because I read of the importance of getting outside of yourself. I studied books on dancing." "I tried to help other people who had difficulty with reading."

One graduate thought that being in a remedial reading class had stigmatized him and "I shied away from people."

Five graduates who felt that remedial reading instruction had an inconsequential effect on their perception of themselves and others made such comments as these: "I never felt that I couldn't get along with people. Even though I couldn't read well my friends didn't tease me." "I didn't improve that much to say it helped me."

The writer secured additional information about the graduates' personal-social adjustment subsequent to remedial reading instruction by asking them to compare their status after leaving the reading classes with what it was prior to receiving instruction in reading. Aspects of personal adjustment included self-confidence, reduction in feelings of inferiority, reduction in tension and anxiety, hopefulness about reading improvement, understanding of reading problem, attentiveness to teachers and classmates and class decorum. An examination of their tabulated responses reveals several points of both importance and interest:

1. Among the total responses, only 6 per cent reported no improvement. Thirty-one per cent of the replies indicated satisfactory adjustment prior to and subsequent to remedial reading instruction; and sixty-three per cent of the answers revealed that the respondents had made some improvement.

2. All but one of the graduates reported that their behavior had been satisfactory before as well as after being in the reading classes. This indicated that their conduct record was uninfluenced by the effect of instruction in reading.

3. Most of the graduates reported the following improvements after leaving the reading classes: greater confidence in their ability to succeed; a reduction in feelings of inferiority induced by failure to read as well as their more successful classmates; less tension and nervousness; a more hopeful attitude toward reading improvement; a greater understanding of their reading problem; and better habits of attentiveness toward their classmates and teachers.

The Value of a Diploma. Were the graduates satisfied that they had finished high school? Thirty said "Yes." Typical of those who were unconditionally satisfied were these:

Job satisfaction and economic security. "My education helped me to pass a civil service exam." "I was admitted into the plumbers' union because I graduated." "I've got a foot in the door to other higher paying jobs. I'm not in the dime a dozen category."

Educational satisfactions. "I went to Queens College and took a two-year course in electronics." "I've enough basic knowledge to be selected for on-the-job training programs."

Personal esteem. "I'm not a bum or a dropout. I've made something of myself." "My children and my family will know I have a diploma and won't think I'm a dummy." "I'm as good as the next person. Getting my diploma showed me that I could finish what I started."

Three graduates had reservations about the value of a diploma because they felt that their reading handicap was too severe to enable them to make much use of their diploma. One boy said, "I can't do much with a diploma if I can't read well."

Their Jobs and How They Felt About Them

At the time they were interviewed three graduates were unemployed, one was in the armed forces, twenty-one were employed in skilled and semi-skilled work, and eight were performing unskilled labor. The occupations and the number of graduates who were engaged in them follow:

Skilled: electrical mechanics (2); electrical repairmen (2); cabinet makers (2); auto mechanic, maintenance man, machinist, steamfitter, utility man, butcher, steeplejack (1)

Semi-skilled: electrician's helpers (2); sprayers (2); machinist assemblyman (1); apprentice plumber (1); apprentice carpenter (1)

Sales: store manager (1)

Unskilled: porters (5); stock boys (2); delivery men (1)

Those presently employed in the trade had obtained their jobs shortly after graduating from high school. With few exceptions, these graduates had been working in the same job for more than one year. Asked whether they enjoyed their present jobs the skilled and semi-skilled workers made these comments:

Stimulation. "I'm always learning something new. The job I learned in school paid off."

Challenge. "I'm working as a steam fitter. You have to use your brains and initiative to figure out things like the time when we had to fix the refrigeration in the hospital to save the lives of patients who were encased in ice."

Understanding Employer. "My boss knows I have a reading problem but doesn't bother me because he finds me reliable and because I'm catching up with my reading. I help four men under me who have trouble with reading."

Security. "I've got a good job, good pay, pension and unemployment benefits."

Future. "Electrical wiring is satisfying and there's a chance for advancement. They're going to train me for a supervisory job."

The dissatisfied group of graduates (all in the unskilled or unemployed category) had drifted from one job to another from the time they left school. Some of their comments follow: "The pay is good but the work is boring. I have to lift too many packages." "The same old things to do. No satisfaction." "I don't trust myself because of my reading. I can't believe that I can succeed without improving it. I can't read job sheets too well."

In general, this group found that their jobs were low paying and uninteresting. In addition, their employers gave them little consideration or hope for advancement.

Vocational Horizons

All but two graduates said that they had a clear idea of what they wanted to do. Half the graduates preferred to remain in their present jobs in the hope that they could qualify for advancement. Two out of three graduates who preferred to remain in their present jobs had had or were taking additional schooling in order to advance their present occupational status. All were presently enrolled in either an apprentice training or an on-the-job training program.

Among the reasons given by those who wanted to change their jobs (12), was the desire to obtain more security for themselves and the family they had hopes of raising. Most of these young men were hopeful of obtaining jobs as policemen, firemen, sanitation workers, meter collectors, or clerks. Only one person, however, knew how to go about studying for civil service examinations. The majority did not have accurate information about their requirements, abilities, and aptitudes for this type of work. One essential item which they seemed to overlook was whether they were able to read well enough to take these examinations.

In view of the fact that none of these graduates was seeking or receiving special help designed to upgrade their reading skills, it is difficult to see how they could possibly expect to achieve their goal.

Individual Differences in Reading

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INTRODUCTION

Which individual difference variables have transfer value at various stages of acquiring the skills required to be an effective reader? The purpose of this paper is to describe a strategy which might serve to guide investigation. Further, suggestions are made as to what individual difference variables might be fruitfully exploited in such studies. Presumably the approach to be described would aid in furthering our understanding of the reading process, as well as in explaining the processes involved in the acquisition of skills upon which the mature reading process is dependent.

ABILITY TO TRANSFER AND HIERARCHICAL LEARNING SETS

In two seminal papers, Ferguson (2, 3) presented a generalized theory which draws together, within a single conceptual framework, the study of human learning and the study of human ability. Abilities are viewed as the result of the overlearning of certain patterns of behaviour. Once overlearned these behaviours remain more or less invariant and a crude limit of performance is reached. The second important aspect of Ferguson's theory concerns the role of ability in subsequent learning. Essentially the question of the transfer value of abilities to subsequent learning is at issue. More importantly, it is suggested that the abilities which transfer and produce their effects at one stage of learning may be different from those which transfer at later stages of learning. Indeed, Fleishman (4, 5) has repeatedly demonstrated this to be the case when the acquisition of various psychomotor skills are at issue. His studies, based on Ferguson's model, disclose that abilities prerequisite to acquisition of skill early in a learning sequence are *not* the same abilities which transfer at terminal stages of learning!

Before elaborating on this line of reasoning, an example relevant to reading may be useful. Consider visual perceptual variables. At an early age (say before 5) such variables are in a state of flux and changing rapidly as a function of maturation and learning. By the ages of 6 to 8 these variables begin to assume the role of abilities a la Ferguson since most normal children demonstrate a stability of performance. Further it is interesting to note that visual perception variables are more strongly related to gross terminal reading performance at the end of first grade, and there is a decrement when the criterion is performance at the end of subsequent grades. This can be viewed as a function of differential transfer at different stages of learning.

More recently, Gagne (6) has presented a model of learning and transfer based on a conception of hierarchical learning sets. For Gagne, a complex learning outcome is dependent upon a set of subordinate capabilities referred to as learning sets with each learning set possibly having several subordinate learning sets. Thus, the hierarchical nature of the model. Subordinate learning sets are viewed as mediating positive transfer to learning sets immediately above them in hierarchy. This is referred to as vertical transfer. Lateral transfer has to do with the broad application of learning sets in a variety of situations. Most importantly, the learning sets at the bottom of the heirarchy are basic human abilities which are immediately relevant to various contiguous superordinate learning sets. Learning sets higher in heirarchy are those sets of behaviours implicated as being particularly relevant to the task to be learned as a function of a sequence of instruction. Of course, all of this is clearly reminiscent of Ferguson's theory. Early in life basic human abilities are developed through the interaction of the individual and his environment. The abilities are the result of attaining a crude limit of learning. If one seeks to instruct someone, certain subsequent learning sets must be imparted and the basic human abilities mediate transfer to these sets. To progress through the hierachy, subordinate sets must be mastered before superordinate sets may be accomplished. In a real sense then each subordinate set must be overlearned and thus become, at least in Ferguson's terms, an ability, which in conjunction with more basic abilities, mediates transfer to higher levels in the hierarchy. Failure to acquire subordinate set mastery would result in a cumulative defiicit for the learner as superordinate learning sets are encountered in an instructional sequence due to an inadequate basis for mediating transfer to higher level.

With the foregoing as a basis for organization, it is now appropriate to ask what are the *basic* human abilities subsumed by the learning set at the base of a hierarchy of learning sets which has at its apex the act of mature reading?

INDIVIDUAL DIFFERENCES: INTRINSIC

It is interesting to note that individual differences, including ability constructs, have largely been the domain of the differential psychologists while experimentalists have tended to regard individual differences on such psychometrically assessed variables as unisance parameters and sources of error to be controlled. Recently, Jensen (14, 15) has referred to such variables (i.e., I.Q., age, sex, attitude and personality traits) as extrinsic individual differences. Extrinsic individual differences are those diferences inherent in learning and do not exist independent of learning itself. In this framework, psychometric ability measures are in a part a function of intrinsic individual differences experience interactions.

It seems obvious that if we want information about a person's ability to learn we should obtain it from the process of learning as opposed to the results of prior learning. The difference is one of a dynamic versus static conception and overcomes the assumption that all have had appropriate experience when we use extrinsic ability constructs as measures of ability to learn. What are some candidates for intrinsic individual differences? Work by Jensen (13, 14) and his associates suggests that serial learning tasks and paired associate tasks are representative points on a continuum of learning requiring from less to more spontaneous verbal mediation. It is postulated that as one moves up a learning set hierarchy in the Gagne sense task demands will be more effectively met by learners who have a propensity to spontaneously verbally mediate. Lest there are those who feel that paired associate tasks are not useful outside of the laboratory, a study by Otto (22) is a useful example in that he found P/A learning to be related to reading ability independent of I.Q. Some additional variables derivable from basic P/A, serial and memory span tasks are the learner's susceptibility to interference effects such as proactive and retroactive inhibition, speed of formation and dissipation of reactive inhibitions, rate of consolidation of memory trace and the like. These, as well as other learning abilities and interference factors have been discussed elsewhere in detail (13).

INDIVIDUAL DIFFERENCES: EXTRINSIC

Let me now turn to a brief consideration of several points which have emerged from cognitive style research which appear to be relevant to research on the reading process. In recent years a great deal of attention has been paid to the study of stylistic dimensions in the performance of cognitive tasks. These dimensions are conceived of as cognitive styles which characterize a person's manner of perceiving, thinking, and problem solving. They represent approaches to the processing of inputs. Here I shall mention only those that have been shown to be related to reading criteria or are likely to be so.

Field independence vs. field dependence—an analytical vs. global manner of perceiving which entails a tendency to experience items as discrete form their backgrounds as a function of the ability to overcome embedding contexts (25).

Reflectiveness vs. impulsivity—reflects the speed with which hypotheses are selected and information processed. Impulsive learners tend to offer the first solution that occurs even though frequently incorrect, whereas reflective subjects ponder various possibilities (17).

Scanning—and individual difference in the breadth and intensity of attention deployment. This leads to variation in the vividness of experience and the span of awareness (12).

Leveling vs. sharpening—at the leveling extreme learners tend to blur similar memories and merge perceived objects with similar but not identical objects in memory storage. Sharpeners are less prone to confuse similar stimuli (7).
Constricted vs. flexible control—susceptibility to distraction and cognitive interference (7, 18).

Other styles which might be mentioned are breadth of categorizing (23) and conceptual differentiation (8). Further, a number of variables from the Structure of Intellect (10) are exemplars of style or mode of cognition as speed, flexibility, divergence, convergence and fluency. I have commented on the possible uses of the Structure of Intellect in psycholinguistic research elsewhere (19).

READING SKILLS

It is often asserted that reading skills can be thought of as nn hierarchically organized set of outcomes. This view is consistent with the thesis of the present paper as well as the Gagne model and the prior theorization of Ferguson. It appears that little has been done to demonstrate this empirically and is an area which needs research. Here I will suggest a very crude taxonomy of some of the early skills presumed to represent hierarchically organized learning sets in reading. Gipson (9) has emphasized the need for a psychological task analysis of the reading process. Her view appears to be consistent with the emphasis of this paper that sequence is of great importance and that certain skills must be mastered prior to acquisition of higher order skills. She has outlined three categories of learning tasks which are at least roughly sequential. They are learning to differentiate graphic symbols, learning to decode letters to sounds, and using progressively higher units of structure. These categories subsume a number of skills resulting from an analysis of the reading task—its discriminating and decoding aspects as well as semantic and syntactical aspects. Should these skills be hierarchically organized, implications for the content and sequencing of instruction will be self evident. The transfer value of basic learning abilities to these skills will serve to provide insight concerning processes. It is not my point here to reccommend a Gipsonian point of view, at least with regard to her limited taxonomy. The main point is, that regardless of the taxonomy employed, appropriate behaviours must be defined representing the various levels and data gathered and examined for hierarchical structure.

DESIGN AND ANALYSIS

There are a number of direct methods of analysis available to evaluate data for hierarchical structure. Within the reading skill domain, assuming appropriate operational definitions for the various skills, it would be necessary to obtain measures on the skills for a sample of subjects representing a wide range of age and reading skills for a sample of subjects representing a wide range of age and reading skill. The resultant data could then be subjected to Guttman scaling procedures (11, 17) and factor analysis with the aim in view of detecting simplicial structure. Should the data conform to a simplex pattern this would be presumptive evidence that reading skills were hierarchically organized.

The type of design suggested by the question of differential transfer calls for gathering baseline data on the basic human abilities (i.e., serial learning ability, P/A learning ability, susceptibility to interference etc.) prior to instruction. During the course of instruction subjects would be measured periodically on the various reading skills (i.e., differentiation of graphic symbols, decoding letters to sounds etc.) at a number of times throughout the instruction sequence. The number of times and the length of the instructional sequence would be contingent upon the number of variables. For any group of subjects the results of all tests could be intercorrelated. The correlations of the basic abilities with the various reading skills would be measures of the transfer value of the abilities to various stages of learning the reading skills (2, 3, 4, 5). In addition to introducting status scores at various points in time during the instructional sequence into such systems of intercorrelations, measures of change from time to time could also be considered (20, 21). Thus, the transfer value of basic abilities to change as well as status at various points in the instructional sequence could be examined.

Studies of this kind would permit observation of the differential transfer effect of abilities at different stages of learning. The correlations might best be further subjected to factor analysis. Presumably different abilities would demonstrate differential transfer by loading different factors over time on the various reading skill assessments. For example, perceptual tasks would probably load highly on factors represented by tasks requiring differentiation of graphic symbols early in the instructional sequence, whereas their loadings on such a factor would decline over time. Further, such perceptual abilities will have smaller loadings on factors representing reading skills superordinate in the reading skill domain. Further elaboration of these methodological strategies and their theoretical support are available elsewhere (1, 2, 3, 4, 5, 19, 24).

Essentially what I have posed as a relevant and researchable question is "What individual differences transfer at various points in the sequence of events leading to the acquisition of reading skill?" This question is one whose resolution would lead to a more adequate understanding of the reading process and the process of learning to read. Once more adequately understood as a process, more intelligent pedagogical suggestions would be forthcoming.

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The Study Skills and Academic Achievement of Marginal Admission Students

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An experimental program was instituted by Wayne State University for students who do not meet the established selective admissions criteria of the University. The program is designed to involve numerous academic and service units of the University in a cooperative effort to assist these students in correcting their marginal deficiencies.

Admission to the program was restricted to high school graduates with an overall grade point average between 2.4 and 2.75 on a four point scale. Candidates with SAT scores in the 700 to 800 range with a verbal score of 400 were given preference. A variety of non-intellective factors were also evaluated by the admissions counselors.

Students who had applied for admission to the University and met these criteria were invited to enter the special program in the Summer Quarter, 1968. In terms of such factors as age, high school attended, and socio-economic backgrounds, they were typical of our regularly admitted students.

During the first quarter all students were required to take freshman English, either social science or political science, and a non-credit reading and study skills course. The class work was supplemented by academic advising, vocational and educational counseling, financial aid service, and tutoring. Beginning with the Fall Quarter they were allowed the usual options in selecting their academic programs.

An important feature of this program is that the students were given one year (four quarters) to correct their deficiencies and demonstrate their competence in college level academic work. They completed their first year in June, 1969. No students were excluded from the program during this period for academic failure regardless of their level of performance.

THE READING AND STUDY SKILLS COURSE

A course combining work in reading improvement and study skills was provided for all marginal students during the first six weeks of the Summer Quarter. Classes met for one hour four days per week. The major objectives of this training were the development of basic college level study skills and increased proficiency in reading college level materials.

A total of 212 marginal students was enrolled in these summer classes. Complete pre- and post-scores were collected on 182 of the 198 students who completed the course. Of these, 155 later completed four quarters of academic work. Informal evaluations by students, instructors, and other staff indicate that the reading and study skills training made a positive contribution to the academic adjustment of these students.

The specific purpose of this paper is to examine the performance of marginal students on the standardized tests regularly employed by our program and to correlate these test scores with their accumulated honor point averages for one year of college work.

READING SKILLS

The Triggs Diagnostic Reading Tests, Survey Section, Form B was administered at the beginning of the summer course as a pre-test. Form A was given at the end of the six week course as a post-test. A comparison of the percentile ranks of the mean scores on these tests with norms based on regular Wayne State University freshmen is presented in Table I.

TABLE I
Percentile Rank of Mean Pre- and Post-Reading Scores of Marginal Students

Variable	Pre-Test	Post-Test
Rate	39	92
Vocabulary	29	54
Total Comprehension	21	29
Total Score	20	36

These data show that the initial mean scores for marginal students fall below those of our regular entering freshmen on all variables measured by this test. They are especially weak in vocabularly and comprehension. They still fall well below the 50th percentile on comprehension at the end of the reading improvement training.

Since the total comprehension score is the sum of the sub-scores on story and paragraph comprehension, a comparison of the differences between pre- and post-test means for these sub-scores was made. These are presented in Table II together with similar data for the rate, vocabulary, and total comprehension scores.

TABLE II
Comparison Between Pre- and Post-Reading Test Mean Scores

Variable	Pre-Test		Post-Test		t
	Mean	SD	Mean	SD	
Rate*	63.511	10.662	86.462	23.484	12.004**
Story Comprehension	15.357	2.896	12.599	3.378	8.358**
Vocabulary	37.324	8.325	43.835	6.628	8.252**
Paragraph Comprehension	12.060	2.666	13.890	2.385	6.906**
Total Comprehension	27.417	4.407	26.489	4.849	1.911

* Rate—number of lines
** Significant at the .001 level

Although all the mean differences shown in Table II except total comprehension are significant at the .001 level, it should be noted that the change in story comprehension represents a loss while that in paragraph comprehension is positive. Thus, the essentially unchanged total comprehension scores mask the fact that important changes did occur in the two types of comprehension measured by the sub-tests. These data may reflect, in part at least, the stress placed by our instructors upon flexibility in rate and understanding main ideas and concepts with memorization of detail considered secondary.

STUDY SKILLS

The Brown-Holtzman Survey of Study Habits and Attitudes (SSHA) was administered at the beginning of the course. Individual profiles were returned to the students and served as the basis for discussions of the role of attitudes, motivation, and study skills in successful academic work. The college freshman percentile equivalent for the mean scores of marginal students on the SSHA are given in Table III.

TABLE III
SSHA Mean Scores and Percentile Ranks

Variable	Mean	Percentile*
Study Skills	44	35
Delay Avoidance	21	35
Work Methods	23	40
Study Attitudes	55	25
Teacher Approval	28	25
Educational Acceptance	27	30
Study Orientation	99	30

* Freshmen norms from the SSHA Manual

The scores presented in Table III represent self-ratings by students who were initially denied admission to the University and were later enrolled in this special program. Their responses indicate both poorer habits and attitudes than the normative sample. It is of interest to note that they score lower on the attitude than they do on the skill factors.

TEST SCORES AND COLLEGE SKILLS

Honor point averages were computed for the 155 marginal students who completed four quarters of academic work. These averages ranged from .57 to 3.36 on a four point scale. Approximately one-half (50.3%) of the group fell below a "C" average. The median HPA was 1.99. The mean was 2.02 with a standard deviation of .475. Correlations between HPA and test scores are presented in Table IV.

These results indicate that only three variables—post rate, post-vocabulary, and educational acceptance—have statistically significant correlations with HPA to at least the .05 level. The magnitude of these

TABLE IV
Correlations Between Test Scores and Four Quarters Accumulated HPA

Test	r
Reading Pre-Test	
Rate	.008
Story Comprehension	.010
Vocabulary	.047
Paragraph Comprehension	.012
Reading Post-Test	
Rate	.188**
Story Comprehension	.043
Vocabulary	.130*
Paragraph Comprehension	.098
Survey of Study Habits and Attitudes	
Delay Avoidance	.101
Work Methods	.049
Teacher Approval	.063
Educational Acceptance	.141*

* Significant at .05 level
** Significant at .01 level

correlations, however, suggests that these factors by themselves have a very limited relationship to academic success for these students.

Validity studies reported in the SSHA Manual list correlations with one semester college grades as follows: Delay Avoidance: .31, Work Methods: .32, Teacher Approval: .25, and Educational Acceptance: .35. The differences between these values and those found in the present study suggest at least two possible conclusions. First, the SSHA may not be a valid measure for marginal students—perhaps due to the restricted range of ability within this group. Second, the marginal students received training in reading and study skills after taking the SSHA. This training may have modified their behavior sufficiently to negate the SSHA as a predictor of grades for this group.

One additional analysis of the relationship between the test variables and grades was made by dividing the total population into two groups. Students with an HPA of 2.00 or higher were compared with those who fell below 2.00. The N's were 75 and 73 respectively. No statistically significant differences were found between the means of these two groups on any of the tests employed in this study.

RATE GAIN AND SSHA

Since the post-rate score was found to have the highest correlation with HPA, we explored the possibility that gains in rate might also be related to initial study habits and attitudes. For this analysis, three groups were identified based on the difference between the number of lines read on the pre-and post-tests. Group I gained 9 lines or less, Group II gained from 10 to 39 lines, and Group III gained 40 or more lines. There were no significant differences between the means of the three rate groups on the initial rate, vocabulary, or comprehension scores. The means and standard deviations for each group are presented in Table V. The t value for the differences between the groups is given in Table VI.

TABLE V
SSHA Means and Standard Deviations for Rate Gain Groups

Variable	Group I		Group II		Group III	
	Mean	SD	Mean	SD	Mean	SD
Study Habits	38.792	15.708	45.725	15.142	46.658	15.205
Delay Avoidance	19.113	9.744	22.110	8.711	22.921	8.467
Work Methods	19.679	7.595	23.615	8.059	23.737	8.169
Study Attitudes	50.472	16.610	55.418	13.966	58.895	11.629
Teacher Approval	25.906	9.270	27.692	7.679	30.105	7.255
Educational Accept.	24.566	8.411	27.725	7.431	28.789	6.090
Study Orientation	89.264	29.225	101.143	26.547	105.553	24.166

TABLE VI
t Values for Differences Between Groups

Variable	Groups I & II	Groups I & III	Groups II & III
Study Habits	2.588*	2.400*	.318
Delay Avoidance	1.850	1.987*	.492
Work Methods	2.931**	2.407*	.078
Study Attitudes	1.824	2.845**	1.456
Teacher Approval	1.185	2.422*	1.692
Educational Acceptance	2.266*	2.778**	.846
Study Orientation	2.432	2.903**	.917

* Significant at the .05 level
** Significant at the .01 level

The relationships between rate gain and the SSHA scores are positive for all factors. The differences between Groups I and III reach at least the .05 level for all scores. None of the differences between Groups II and III are statistically significant. The high and low gain groups show somewhat greater differences in attitudes than they do in habits. It appears from these data that students with the more favorable SSHA scores also achieve the greatest gains in rate during a reading improvement course.

SUMMARY AND CONCLUSION

The purpose of this paper was to examine the reading and study skills test scores of marginal admission students as compared with regularly admitted freshmen and with their later academic performance.

The results indicate that marginal students are less proficient than regular students in reading skills. They are especially weak in vocabulary and comprehension. After a six week reading improvement course, they show statistically significant gains in rate, vocabulary, and paragraph comprehension. On story comprehension, a test over the material read for rate, they show a significant loss.

On measures of study habits and attitudes, the mean scores for marginal students were also below the college freshmen average. The attitude scores were slightly lower than those for habits.

Honor point averages for marginal students after one year of college were found to have statistically significant correlations with post-training rate, post-training vocabulary, and the Educational Acceptance scale of the SSHA. The magnitude of these correlations, however, was so small as to preclude their value as individual predictors.

It may be concluded from this analysis that marginal students, in general, do not perform as well as regularly admitted freshmen on the standardized tests studied. It is not clear, however, as to the relevance of these measures to factors important to the academic success of marginal students. Certainly, as here employed, they are of little or no value for the prediction of college grades by themselves. Perhaps a combination of these scores with the traditional admissions data would produce a more valuable predictor.

The Measurement of Internal (Intra-Article) Reading Flexibility

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Virtually all studies of reading flexibility have been carried out by comparing the over-all reading rate achieved by readers on two or more passages. The mean differences among these gross rate measurements are related to some one or more reading situation variables as an indication of reading flexibility. This type of "inter-article" reading flexibility has been called "external flexibility" by McCracken (1965) who maintains that external flexibility must be a by-product of "internal flexibility"—the adjustment of approach and rate within the sentences and paragraphs which make up a total passage. It is conceivable that two readers might display the same average words per minute rate on the same passage, and yet one reader might have adjusted his rate several times while reading the total article, whereas the other reader might have read at a much more constant rate throughout the passage. What is needed is a more fine-grained observation of "intra-article" flexibility. If we can take a closer look at this important reading skill, perhaps we can learn to understand it better and, therefore, do a better job of teaching it in the classroom.

This paper will present a new method of measuring internal (intra-article) reading flexibility which will indicate the degree of flexibility in the form of a "flexibility coefficient." The relationship of this type of flexibility to several variables will be studied. Before describing this new approach, let us examine several conceptions of reading flexibility and review the research in this area.

CONCEPTIONS OF READING FLEXIBILITY

A Relationship between Variables.—All conceptions of reading flexibility in the literature assume that this skill consists of a relationship between a dependent variable involving reading behavior and some one or more reader or reading material variables. Variability in reading behavior, as such, has not usually been considered to be reading flexibility. Two different, but related, dependent variables have been used in conceptualizing reading flexibility. One variable is "rate" and the other is "approach." As an example of the first, Braam (1963) presents the following definition: "flexibility in reading is considered to be that characteristic possessed by the mature efficient reader which enables him to adjust or vary his rate of reading in order to deal effectively with different reading situations." In keeping with this concept, Braam and Berger (1968) report a direct correlation between gains in flexibility and reading rate and state, "It may, therefore, be anticipated that a gain in reading will be accompanied by increased flexibility." McDonald (1963), on the other hand, maintains that, "Variability in rate, however, is not the cause of flexible reading. Rather, rate variability is the result of flexible reading approaches." By "approaches," McDonald means the whole gamut of perceptual and cognitive operations involved in the reading process. However, McDonald does use rate measurements as a reflection of the extent to which the reader is flexibly adjusting his reading "approaches."

Independent variables which are related to changes in approach or rate as an indication of reading flexibility vary from one investigator to another. Among reader characteristics commonly cited are purpose, psychological set, familiarity with subject matter, and understanding of concepts. Reading material characteristics mentioned include difficulty (i.e., readability), style, ideational density, and content. In practice, however, all of these variables have not been studied systematically in the literature on reading flexibility. Let us look at several actual operational definitions of flexibility embodied in the number of measuring instruments.

Operational Definitions.—Spache (1956) constructed a reading flexibility test for use by college students and adults which measures variation in rate in relation to three reading purposes: 1. skimming—to answer general questions, 2. scanning—to answer a number of detailed questions, and 3. reading thoroughly—to get main ideas, details, conclusions, etc. The same material is read three times—one for each designated purpose. Thus, purpose is manipulated systematically with all other conditions held constant.

Letson (1959) constructed a test for college students to provide an independent measurement of the influence upon rate of article difficulty and reading purpose. The first part of the test consists of two articles—one easy and one difficult—with instructions to read as rapidly as possible and still understand in order to answer questions. The second part of the test includes two articles of equal difficulty—one with instruction to read as rapidly as possible for the story and the other with directions to read for complete mastery of ideas and details. In Letson's test, the relative influence of difficulty and purpose can be studied systematically. However, content is not held constant.

McDonald *et al.* (1961 & 1962) constructed two reading versatility tests—one for pupils in grades five through nine and one for pupils in grades eleven and higher. These tests measure the influence upon rate of several variables simultaneously. Directions are given for four purposes—1. thoughtful reading with careful attention to detail, 2. accelerated reading for the main ideas and events, 3. skimming for general information, and 4. scanning to locate specific facts. Different materials written at various levels of difficulty are read for different purposes. Therefore, any resulting differences in rates may be due to any or all of these confounded variables. Such a measurement procedure is quite in keeping with McDonald's conception of reading flexibility.

Another flexibility test was constructed by Braam and Sheldon in about 1963 for use with secondary school pupils. This test measures the effect of familiarity with the subject matter upon rate. In this test, purpose is held constant for all reading selections with instructions to read carefully and accurately to understand main ideas, important facts, and details. The person taking the test reads five passages—each selected from a different subject-matter field and written at approximately the same level of difficulty. Unlike most flexibility tests, the Braam-Sheldon test does not measure the influence of purpose upon rate.

Weintraub (1967) has defined reading flexibility as "the ability to adjust one's rate and approach to reading with the purpose for reading, with the difficulty of the material, and with one's background or knowledge of the particular subject matter." It is evident that this broad definition incorporates all of the operational definitions of flexibility just described. However, since different tests of reading flexibility embody different conceptions of this term, research in the area must be interpreted with caution. Most of the research to be cited in the following review is based upon the variation of rate with purpose which, in many cases, is confounded in unknown degree with otther variables. There is little replication of studies on what might be called "reading material difficulty flexibility" or "subject matter familiarity flexibility." Furthermore, research has virtually been confined to the study of "external flexibility." Keeping these reservations in mind, let us make a quick review of research on this topic.

REVIEW OF RESEARCH

Most of the research in this area has been concerned with four general questions:

1. How flexible are readers?
2. Can reading flexibility be trained?
3. What variables are related to reading flexibility?
4. What kind of concept do readers have about reading flexibility?

How Flexible are Readers?—Studies by Herculane (1961), Shores (1960), Braam (1963), Hill (1963), Smith (1963), McDonald (1965), Gifford and Marston (1966), and Boyd (1966) all concur in the general conclusion that readers are surprisingly inflexible. McDonald (1963) concludes that in the study of over six thousand readers of various ages, "More than ninety per cent tend to maintain a characteristic approach despite instructions for differentiation of purpose and in spite of variations in difficulty of style, text, and content."

Can Reading Flexibility be Trained—Although it appears that most readers are rather inflexible, studies by Braam (1963), Mitchell (1965), Smith (1966), and Braam and Berger (1968) suggest that readers can become more flexible with training. Thus, if the readers are not flexible and flexibility can be improved with training, we must assume that this is not being taught well in the classroom.

What Variables are Related to Reading Flexibility?—Very little is known about variables which are related to reading flexibility. This may be due to the restricted range of flexibility measurements found in many studies. Blommers and Lindquest (1944) found that good comprehenders adjust their reading speed to fit the difficulty of the material, whereas poor comprehenders tend to read both easy and difficult materials at about the same rate. Buswell (1951 found a relationship between flexibility and "rate of thinking" of the reader. Shores (1960) observed that mature readers are more flexible than younger readers. Information appears to be sparse about related variables in this research area.

What Kind of Concept do Readers Have About Reading Flexibility?—The writers have been able to find only two references on this point. Both Shores (1960) and Herculane (1961) working with sixth and eighth-grade readers, respectively, observed that these pupils had only a very hazy concept of the whole notion of reading flexibility. Perhaps it would be interesting to poll the teachers on this point.

From this brief review of research, it can be seen that the evidence is very spotty in this area. Well organized programmatic research is needed here so that we can obtain an understanding in depth about many dimensions of this topic.

RATIONALE FOR THE PRESENT STUDY

The conception of reading flexibility upon which the present study is based is that of internal (intra-article) adjustment in rate as a function of variations in the difficulty of the reading material in successive portions of a total article. Although rate is measured as a dependent variable, it is assumed that variation in rate reflects changes in reading "approaches" as the reader encounters material of varying degrees of difficulty (i.e. readability). The relative difficulty of successive portions of the material is influenced by variables such as degree of novelty, complexity, and abstraction. It is assumed that the predictability of successive portions of a passage, as measured by the "cloze procedure" would accurately reflect variations in difficulty level for a particular group of readers.

The use of "material difficulty" rather than "reader purpose" as an independent variable in flexibility measurement, has much to recommend it. In a study of reading flexibility among college students, Letson (1959) found that the difference in rate brought about by difficulty of material was 43% greater than that caused by instructions to read for different purposes. Furthermore, he found that slowing down to read more difficult material was important to achieve good comprehension, but that it was not necessary to slow down to achieve mastery of materials of equivalent difficulty. In fact, instructions to read for mastery caused some students to pay more attention and, hence, to read more rapidly. It may be, therefore, that the use of "purpose" as an independent variable in most flexibility studies accounts for the small degree of reading flexibility found among readers of all ages.

The present investigation will explore internal variations in rate as a function of difficulty, and will study the relationship of such flexibility to the following variables—training, personality, reading speed, and comprehension.

PROCEDURE

Measurement Techniques.—The general procedure used in this investigation was as follows: First, 255 college students enrolled in college reading improvement classes were instructed to read an easy 2,000 word article with the following purpose—"Read as rapidly as you can and still understand what you read." Subjects were instructed to underline the word that they were reading each time the experimenter gave the vocal signal "Mark." These signals were given at fifteen-second intervals throughout the time that the subjects were reading. The purpose of this exercise was to provide an adaptation period to desensitize the subjects to possible disruptive reactions to the measurement procedure used in this study. Second, immediately following the "adaptation period," the subjects repeated the same procedure using a mimeographed copy of the Story of Comprehension sub-test from the *Diagnostic Reading Test: Survey Section.* After completing the story, each subject was given the twenty test questions used to measure comprehension of the story without looking back at the material. Three, all subjects were administered the *SA-S Senior Scales,* a personality test devised by Donald Smith to measure anxiety level and introversion-extraversion. Four, procedures described in steps one and two were repeated both before and after training in a one-semester course in reading improvement. Two equivalent forms of the *Diagnostic Reading Test* were used.

Pilot Study.— A possible reason for the absence of internal flexibility studies in the literature may be due to the results of a study by McDonald (1960) which showed that the reading of college students with high (i.e. above average) anxiety was significantly impaired by testing procedures involving periodic interruptions. Both rate and comprehension were lower for high anxiety subjects than for low anxiety subjects. This was not true under conditions of continuous reading. McDonald concluded that, "Timing procedures which produce periodic interruptions during the reading process should be avoided."

This conclusion may have inhibited research on internal flexibility which necessarily involves periodic interruptions. It ignores the possibility that contamination of reading test results by personality variables under periodic interruption conditions might be reduced by giving all subjects a practice period to accustom them to these measurement conditions. The previously described practice procedure was designed to reduce any detrimental effects of this measurement procedure on subjects with a high anxiety level. Table 1 and Table 2 present average rate and comprehension scores for subjects with high and low (i.e. above and below average) anxiety levels both before and after training in a reading improvement course. These results are based on the *Diagnostic Reading Test—Survey Section* data obtained *after* the adaptation-practice period.

TABLE 1
Reading Rate* for Subjects with High and Low Anxiety

	High Anxiety (n = 127)		Low Anxiety (n = 127)		
	x	s	x	s	p
Before Training	31.5	5.9	30.8	5.5	>.05
After Training	27.3	5.5	27.1	5.8	>.05

* Rate = Mean number of 15 second intervals taken to read passage.

TABLE 2
Reading Comprehension* for Subjects with High and Low Anxiety

	High Anxiety (n = 127)		Low Anxiety (n = 127)		
	x	s	x	s	p
Before Training	15.1	2.9	15.7	2.4	>.05
After Training	14.4	2.7	14.7	2.4	>.05

*Comprehension = Mean number of comprehension questions answered correctly.

As a result of this pilot study, it may be concluded that periodic interruptions did not have any more detrimental effects upon the reading performance of high anxiety subjects than of low anxiety subjects. In view of the fact that these students were poor readers to begin with, these results do not indicate that the measurement procedure was particularly detrimental to either group. Apparently, the adaptation-practice period served its purpose. As a result of this pilot study it was concluded that internal flexibility could be measured.

Data Analysis.—To measure the strength of internal flexibility, a statistic was needed to measure the degree and direction of the relationship between variations in reading rate and variations in reading difficulty. To obtain a "flexibility coefficient," the following steps were taken: First, rate measurements in the form of fifteen-second interval markings were converted to the number of fifteen-second intervals each subject "used-up" for each successive one-hundred word passage in the *Diagnostic Reading Test* article. The last segment of the test consisting of less than one-hundred words was ignored. In measuring flexibility, therefore, rate was defined as the number of fifteen-second intervals used for each successive one-hundred word passage. Second, the difficulty of each successive one-hundred word passage was measured by use of the "cloze procedure" with another group of comparable subjects. Two, every-fifth deletion cloze tests were devised for both forms of the reading test. One cloze test form was devised by starting with the first word and deleting every fifth word thereafter, and the other cloze test form was formed by starting with the second word and deleting every fifth word. The two cloze forms for the pre-training test were given to two groups of twenty-one students in reading improvement classes. Two cloze forms for the post-training tests were given to two groups of 22 students from these classes. These students were not involved in the main study. An analysis of variance revealed that the two cloze test form were comparable for each test. Therefore, they were combined to form one measure of readability. Mean cloze scores were computed for each successive one-hundred words in each test. Third, a flexibility coefficient was formed by computing a Pearson correlation between the distribution of successive rate measurements and the distribution of successive difficulty measurements for the same article. A high *negative* correlation indicates maximum flexibility. This is because fast reading is reflected by a small number of fifteen second intervals per one-hundred words; whereas easy reading material is indicated by a high cloze score for a one-hundred word passage. For flexible readers, as the cloze score becomes higher, the rate score tends to decrease. Such a flexibility coefficient can be computed for groups of people or for individual subjects.

Problems to be Investigated.—This study was designed to investigate the effects of training on internal flexibility and to determine the relationship, if any, between such flexibility and over-all reading speed, reading comprehension, anxiety level, and intro-extraversion of readers. For these purposes, flexibility coefficients were computed for the total group of 255 subjects both before and after training and for sub-groups of 127 subjects who fell in the top or bottom half of the distribution for speed (i.e. total number of fifteen second intervals taken to read the entire article), comprehension, anxiety level, and introversion-extraversion. Flexibility for each of these sub-groups was measured both before and after training.

RESULTS

The magnitude of flexibility coefficients for the total group both before and after training is presented in Table 3.

It can be seen that the pre-training coefficients of —.34 does not differ significantly from zero. These poor college readers did not demon-

TABLE 3
Flexibility Coefficients Before and After Training

Before (n = 15)	After (n = 18)
— .34	— .48*

*p <.05

strate, as a group, any measurable internal flexibility. The post-training coefficient of —.48 significant. However, the magnitude of even the post-training coefficient is rather low. Possible reasons for this will be given later. It should be noted that although 255 subjects were used in obtaining these flexibility coefficients, the n for the correlation was given by the number of one-hundred word segments upon which rate and difficulty measurements were based.

If the results of this investigation are to be believed, the pre-training internal flexibility coefficient of each sub-group studied (i.e., high vs. low comprehension, over-all reading speed, anxiety, and introversion-extraversion) was virtually the same as the total group pre-training flexibility coefficient. All post-training sub-group coefficients were also approximately the same as the total group post-training coefficients. Either internal reading flexibility is a remarkably stable phenomenon as far as group differences are concerned, or the technique of arriving at sub-group coefficients by correlating *sums* of rate measurements for each one-hundred word segment (for a particular group) with the corresponding difficulty measurements serves to obscure sub-group differences. The writers are reluctant to accept the validity of the sub-group flexibility coefficients. We are now in the process of computing individual coefficients for each subject to see if different results will be forthcoming.

Limitations of the Study.—This investigation had the following limitations: First, the subjects had a limited range of reading skill because they were selected from the lower third of a distribution of college readers. A more normal distribution of readers would undoubtedly show a greater degree of flexibility. Second, the distribution of successive cloze test scores within the article revealed a limited range of difficulty. An article selected (or constructed) to display greater variations in readability might reveal a greater degree of flexibility. Third, the effect of pooling rate measures for computing group flexibility coefficients is not understood at present.

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Word Length and Form Class Factors in a Sample of Continuous Prose

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While there has been much support for the notion that cloze procedure provides a measure of passage comprehension, there is good reason to believe that cloze measures also tap other abilities. MacGinitie (8, p. 121) pointed out that restoring missing words to a passage is not solely a reflection of passage comprehension, but, instead, may indicate the recognition of a familiar grammatical construction. Weaver and Kingston (11, p. 259) have demonstrated that cloze tests of varied types are more related to each other than they are to verbal comprehension or a factor they defined as "rote memory, flexible retrieval." They also noted that much of the variance associated with cloze tests was unexplained by their analysis. The variance accounted for by cloze tests, Weaver and Kingston (11, pp. 258-259) labeled a "redundancy utilization" factor, the ability to make use of redundancy characteristics within the language. It follows that since any sort of restriction on occurrence can be considered equivalent to redundancy, the grammar of a language must produce redundancy. Gleason (7, pp. 458-459) suggests that the grammar of a language can be considered a set of restrictions on the occurrence of possible structures within the language.

In 1952 C. C. Fries (6) redefined traditional parts of speech categories to form a more economical and functional grammar for the structure of English. Researchers (2, 4, 9, 10) investigating cloze procedure have made frequent use of this grammar. In his system of classification, Fries (6) distinguishes between function words and form classes regrouping what were once considered separate categories of words into single collective classes having common positional, functional, and morphological characteristics. To some extent, form classes corresponds roughly to nouns, verbs, adjectives, and adverbs. Function words, on the other hand, serve to connect parts of a sentence grammatically. They are analogous to the more familiar articles, prepositions, conjunctions, etc. In addition to grammatical classification, word length was varied in this study. Bormuth (2, pp. 98-99) has shown that words containing few letters or having a high frequency of occurrence in English tend to be less difficult to restore in a mutilated passage than words of lower frequency or longer length. According to Zipf (12, pp. 20-29) words tend to become shorter with increasing use; thus, word frequency and word length are strongly related. Three cate-

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gories of word length and four grammatical categories comprised the two-factor classification scheme. This study explored to determine whether or not cloze tests tap the ability to utilize grammatical redundancies and word length as contextual aids to passage comprehension.

METHODS

Sample

One hundred and fifty subjects were selected from among juniors and seniors majoring in education at both the University of South Carolina and the University of Tennessee.

Procedure

A sample of 4,555 words in a selection entitled "How to Be an Employee" was classified according to grammatical category and word length. Form class 1, form class 2, form class 3, and function words in three categories of word length (two to four, five to seven, and eight to sixteen letters) comprised the eleven categories of words to be investigated. Since few function words were found to exceed seven letters in length, it was not possible to construct a twelfth category of long function words (See Table 1).

TABLE 1
Frequency of Grammatical Occurences for Each Word Length Category

Number of Letters	Form Class 1	Form Class 2	Form Class 3	Function Words
2-4	577	391	74	1692
5-7	408	214	223	251
8-16	467	110	148	

Fifty words were selected at random from each category and deleted from the passage. The cloze test constructed in this manner was administered to small groups of approximately twenty subjects over a period of one week. A test-retest reliability coefficient of .75 was obtained for the test.

Cloze test scores for all subjects were recorded on IBM work sheets. Scores earned by the 150 subjects on each of the eleven previously described category variables were subjected to a principal axis factor analysis for the purpose of determining underlying factor structure. Diagonal communalities for the principal axis analysis were estimated using the squared multiple correlation method (SMC) as described by Cureton (5, pp. 4-5). The determination of salient factors to be subjected to promax rotational procedures was made with the assistance of (a) Cattell's *scree test* (3, p. 206), (b) Bargmann's normal deviate test (1), and (c) an examination of factor loadings on the initial principal axis factor matrix. Salient factors were then subjected to three promax rations for the purpose of obtaining meaningful structure.

RESULTS

Means and standard deviation observed for the eleven category variables are given in Table 1. A casual examination of data in Table 1 revealed two noticeable trends. Specifically, there appeared to be a direct relationship between word length and difficulty. Further, both short and medium length adjectives apparently constituted greater difficulty for subjects than other word types of comparable length.

TABLE 1
Means and Standard Deviations for the 11 Reading Variables
(N = 150)

Variable	Description	M	SD
1	Short-noun	29.79[a]	4.51[a]
2	Short-verb	31.03	4.39
3	Short-adjective	15.02	4.15
4	Short-function word	27.55	4.17
5	Medium-noun	16.83	3.93
6	Medium-verb	17.81	4.56
7	Medium-adjective	10.47	3.32
8	Medium-function	23.59	5.25
9	Long-noun	11.27	3.55
10	Long-verb	7.33	2.98
11	Long-adjective	8.81	3.26

[a] Rounded to the nearest hundredth.

The eleven variables were initially factored to five factors. Table 2 provides some of the data needed to determine the exact number of salient factors to be retained for rotation, the most crucial decision in the factor analytic process. The first test applied to the data of Table 2 was Cattell's *scree test* cited above. Essentially, the eigenvalue difference column is studied for the purpose of determining where (1) the differences begin to "level off" or (2) a reversal in magnitude of difference occurs. Since no obvious leveling off reversals in eigenvalue differences occurred in the data, the results of the *scree test* were unclear. Bargmann's normal deviate test suggests the presence of two significant factors if the rule of thumb is employed that the factors associated with the first negative 2-score constitutes the last significant factor. However, the Bargmann test is known to underestimate the number of significant factors when the number of observations is relatively small as in this instance.

TABLE 2
Data for the Determination of the Number of Salient Factors
(N = 150)

Factor	Eigen-Value	Difference	Per Cent Variance	Normal Deviate
1	5.99[a]		85.75	1.49
		5.50		
2	.49		92.71	- 2.17
		.25		
3	.24		96.08	- 4.04
		.08		
4	.15		98.29	- 5.17
		.04		
5	.11		99.95	- 5.94

[a] All values rounded to nearest hundredth.

In the absence of a clear determination resulting from the application of the scree and Bargmann tests, factor loadings on the initial principal axis factor matrix, presented in Table 3, were carefully examined. Loadings in excess of .250 were associated with the first two factors clearly indicating at least a two factor solution. An examination of Factor 3 loadings also revealed a significant loading (.309) for variable six and since exclusion from rotation of Factor 3 would negate a substantial share of the common variance for variable six, *the decision was made to rotate three factors.*

TABLE 3
Initial Principal Axis
Factor Matrix

Variables	Factors				
	1	2	3	4	5
1	.755	-.248	-.062	-.141	-.025
2	.770	-.233	.094	.101	.042
3	.673	-.150	-.134	.142	-.181
4	.832	-.145	-.191	-.004	.019
5	.757	.137	-.009	-.139	-.156
6	.788	.026	.309	.112	-.030
7	.700	-.134	.157	-.230	.080
8	.870	-.038	-.032	.135	.143
9	.622	.246	-.193	-.031	.071
10	.615	.359	.091	.023	-.109
11	.690	.314	-.039	.004	.105

The third, and final, promax rotation for the reduced factor matrix is contained in Table 4. Factor loadings less than .250 were deleted from Table 4 to assist in the interpretation of factors.

TABLE 4
Rotated Matrix Factor

Variable	Factor 1	Factor 2	Factor 3
1	.486		
2	.402		
3	.415		
4	.494		
5		.288	
6			.400
7	.267		.253
8	.343		
9		.416	
10		.436	
11		.448	

Two points should be considered prior to providing substantive interpretations of empirical factors. First, those variables that demonstrate the highest absolute loadings on a given factor should be given major emphasis. Of course, the remaining variables are also considered; however, they do not serve as the focal point of attention. Secondly, interpretations are more meaningful if it is remembered that factors explain only the correlations among variables in a given set of data.

Factor 1 is summarized below:

	Factor 1	
Variable 4	Short function words	.494
Variable 1	Short nouns	.486
Variable 3	Short adjectives	.415
Variable 2	Short verbs	.402
Variable 8	Medium function	.343
Variable 7	Medium adjectives	.267

Variables 4, 1, 3, and 2, because of the greater magnitude of their loadings, were given greatest emphasis by these researchers relative to the interpretation of Factor 1. The obvious communality possessed by these four variables was short word length suggesting that Factor 1 comprised a word length factor, specifically, a *short-word length factor.* The moderately low loadings of variables 8 and 7 tended to obscure the above interpretation somewhat. However, it should be noted that both variables 8 and 7 have medium word length in common as opposed to long length, and therefore, the short word rubric still appeared to be a viable hypothesis for the labeling of Factor 1.

The explanation for Factor 2 also appeared to be based upon a word length dimension as revealed by the summary below:

Factor 2

Variable 11	Long adjective	.448
Variable 10	Long verbs	.436
Variable 9	Long nouns	.416
Variable 5	Medium nouns	.288

Long word length was common to the three variables that most predominantly defined the second factor. Factor 2 was, therefore, interpreted as a *long word factor* although it was observed that medium length nouns also shared some variance with the constallation of long word grammatical variables.

Serious problems were confronted in attempts to explain Factor 3. From the summary of Factor 3, presented below, it can be seen that only two variables load significantly on this factor.

Factor 3

Variable 6	Medium verbs	.400
Variable 7	Medium adjectives	.253

Both variables consist of medium length expressions; however, interpreting a factor on the basis of only two significant loadings is most precarious. It is possible that a medium length factor attempted to emerge, but because of either insufficient variable input or the medium length expressions' lack of empirical distinctiveness, a clear factor definition was not obtained. At the present time, these researchers have adopted a conservative posture relative to the interpretation and definition of this ambiguous factor by choosing to await the results of a replication of this investigation.

DISCUSSION

Needless to say, both the resultant factor structures and *a posteriori* interpretation must be regarded as highly tentative, especially in view of the limited number of input variables and the relatively small sample. Perhaps, however, this research is of interest not for what was empirically realized but rather for that which was not observed. That is, the observed findings provided no support for the notion that form class or grammatical redundancies constituted the underlying factor related to performance on the cloze test, for if that were the case, resulting factors would have been defined by variables manifesting homogeneous word categories. Apparently, the ability to successfully respond to various word lengths, rather than categories, was measured by the cloze test.

Tentatively, this analysis lends support to the "rote memory, flexible retrieval" factor defined by Weaver and Kingston (11, p. 261) in that the two distinct factors related to word length which emerged imply a differential memory or retrieval function for long and short words. A clearer explanation will be possible with the addition of other input variables related to memory functioning. Measures of vocabulary, symbol manipulation, and coding are interesting possibilities.

SUMMARY

Four grammatical categories and three word length categories were factor analyzed. Two factors emerged and were identified as a short-word and a long-word factor. A third factor which attempted to emerge was not interpreted pending results of a replication of this study. The observed findings provided no support for an underlying ability to make use of grammatical redundancies as a contextual aid to passage comprehension.

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Step-Wise Analysis of Word Association Data

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Word association tasks are common in educational and psychological research . Much concern has been directed toward the nature of the response relative to its psychological, psycholinguistic and communicative value. But very little concern has been directed toward the effects on responses that might obtain as a function of varying modality of input of the stimulus word. Otto's studies (6, 7, 8) indicated that types, levels, and organization of responses might vary as a function of mode of presentation. A more recent study by Reynolds and Palmatier (10) demonstrated that while responses to stimuli presented orally, pictorially, and in print correlated significantly, these relationships were not of any impressive magnitude and were more appropriately evidence to sustain an argument for differing response populations for differing presentation modes. In a follow-up of that study Reynolds, Bickley, Champion and Dekle (9) found that variations of input (oral vs. printed presentations) resulted in significant differences in the number of paradigmatic responses elicited and that these differences were highly associated with age: younger children in that experiment produced paradigmatic responses more often to orally presented words than to printed words with the responses becoming more homogeneous as older groups were tested. The implications of each of these experiments strengthened the contention that some concern must be centered on explicating the input processes at least to the extent of determining whether the responses could reasonably be attributable to the mode of presentation.

PROCEDURE

Subjects. Ss were 70 males and 70 females randomly selected from adult basic education classes in the Atlanta area. All were capable of reading at the third grade or higher level. Seven experimental groups were defined and balanced by sex and achievement level so as nearly to equate each group. Ss were assigned to one of the following stimulus presentation groups: (1) oral, (2) visual or pictorial, (3) graphic or printed, (4) oral-visual combination, (5) oral-graphic combination, (6) visual-graphic combination, (7) oral-visual-graphic combination.

Process. A list of 20 words that had been used in previous studies was prepared for presentation in each of the treatment combinations.

TABLE 1
Stimulus Words Used in Experiment

spoon	house	chair	dress
man	hammer	broom	book
fish	school	pencil	bus
bed	clock	paper	dog
cat	horse	girl	hat

These words appear in Table 1. Ss were requested to write on separate pages of an answer booklet all their responses to each stimulus word.

Criterion. Responses of each group were recorded for each stimulus word. Any response which was not elicited by at least six Ss within one group was eliminated from further analysis. If a response was offered by six Ss in a single treatment group, then this response was retained even though it may not have appeared in any other group. Thus, to some extent, idiosyncratic responses were minimized.

Definitions of the criterion in this manner resulted in the determination of a sample of words which met the minimal cut-off. 181 words were defined and used as the entities in a factor analysis with the even treatment combinations serving as the variables. Cell entries were the occurrence scores of the 181 words for each treatment.

ANALYSIS

The seven variables were intercorrelated by the product-method and were factor analyzed by the principle component method with one's in the diagonal. The factors were rotated to an orthogonal solution by Kaiser's Varimax procedure (5). All the component analyses and rotations reported were performed by an IBM 7094 computer using the BMDO3M General Factor Analysis program (3).

Earlier studies suggested that data of the type being examined could produce a strong verbal factor (11). The first factor analysis of the present data confirmed the presence of a single large factor. Table 2 gives the eigenvalues and cumulative proportion of total variance. The first factor accounted for 58% of the total variance and represented the only factor with an eigenvalue greater than one. A scree test, as proposed by Cattell (2), suggested the existence of other minor factors. It was decided that the effects of the first factor should be removed before rotation.

Three methods designed to remove the effects of the first factor were employed and their results compared.

Method 1. The original factor matrix was rotated after the deletion of the first column.

Method 2. A factor score was computed for each word on the first factor by weighting the variables by the loadings of the unrotated first principal component. A new correlation matrix was computed using the original variables and the one artificial variable. A partial correlation matrix was formed by partialing out the effect of the artificial variable from the other variables. This partial correlation matrix was then factor analyzed.

Method 3. The maximum-likelihood method of factor analysis was used to remove the first factor. A factor analysis program (FCAN) written by Bargmann (1) was used to remove the first factor. The partial correlation matrix formed in the process was then factor analyzed and rotated in the same manner as in method 2. Eigenvalues for methods 2 and 3 appear in Table 2.

TABLE 2
Eigenvalues and Cummulative Variance Proportions
for Three-Factor Analysis Procedures

ORIGINAL DATA						
Eigenvalues						
4.06	0.83	0.61	0.45	0.42	0.33	0.30
Cumulative Proportion of Total Variance						
58	70	79	85	91	96	100
METHOD 2						
Eigenvalues						
1.87	1.43	1.12	1.01	0.86	0.71	0.[illegible]
Cumulative Proportion of Total Variance						
22	47	63	78	90	100	100
METHOD 3						
Eigenvalues						
1.30	1.27	1.11	1.03	.90	.71	.69
Cumulative Proportion of Total Variance						
19	37	53	67	80	90	100

Even though in all three cases presented in Table 2 a scree test mildly points to a two factor solution (in reality three factors if you count the strong verbal factor) it was decided to follow the technique suggested by Findley (4), who suggested that "the availability of efficient computer programs makes it advisable to try not merely the number of factors dictated by the eigenvalues, but successively additional factors until the meaning of the pattern is clarified."

RESULTS

Table 3 gives the rotated two factor solution of the original data with no semblance of simple structure.

Table 4 gives the rotated three factor solution of the original data and the rotated two factor solution for each of the three methods. As was expected, the rotation of the original factor matrix was quite different from those of the three partialing methods. The three methods agree closely. One factor consists of variables 5, 6, and perhaps 2.

TABLE 3*

Original Two-Factor Solution After Rotation

Variable	I'	II'	h^2
1	70	35	61
2	46	71	72
3	76	35	70
4	75		62
5	84		73
6		91	84
7	44	66	68

*All decimals and loadings of .30 and below are omitted.

The other factor consists of variables 1, 3, and probably 7. Variable 4 loads on both factors.

Table 5 gives the rotated four factor solution of the original data and the rotated three factor solution for each of the three methods. Again, the rotation of the original factor matrix was quite different from the three partialing methods. The three methods again agree that variables 1, 3, and 7 form a factor, but a second or third factor is not clearly defined.

It did not seem valid to rotate for another factor in that the scree line showed no inflection and the number of original variables was so small.

CONCLUSIONS

Too often in educational research, particularly research which involves variables that may have a particularly strong general factor or verbal factor, the residual factors which may be our primary concern are obscured. Ordinary factor analytic procedures may not yield the types of information about the variables that are being sought. The result is either misinterpretation of the data, or more often, the rejection of otherwise plausible hypotheses because the analysis technique was torpedoed by a major factor of no immedate concern.

Three procedures have been suggested to avoid the pitfalls of the unwanted single factor solution. Preliminary indications on the present data lend support to the use of any of the three over conventional factoring approaches. Each approach is substantially different from the original, yet each yields a simple structure, multi-factor solution. Better yet, the results of the three partialing methods are in agreement and shed some light on the original question about differences in input. Parsimony dictates that since each of the methods yields similar results, the simplest procedure is favored. For these data this would be method 1. The caution to be considered centers around a communality problem. Method 1 gives lower communalities than either Method 2 or 3. If all the loadings on one or more of the variables are so small that the variable cannot be identified within a fac-

TABLE 4*

Rotated Three-Factor Solution of Original Data and Two-Factor Solution for Each of Three Methods

ORIGINAL DATA

Variable	I'	II'	III'	h^2
1	83			80
2		69	43	75
3	79			79
4			88	88
5	66		53	73
6		90		85
7		63	47	70
METHOD 1				
Variable				
1			—46	21
2				09
3			—35	13
4		—47	36	35
5		—36		16
6		62		41
7				08
METHOD 2				
Variable				
1			—72	52
2		55	34	42
3			—65	46
4		—53	52	55
5		—73		53
6		70		50
7			49	32
METHOD 3				
Variable				
1			66	44
2		49		25
3			69	48
4		—43	—36	31
5		—55		31
6		70		49
7			—47	28

*All decimals and loadings of .30 and below are omitted.

tor, then either of the other two methods becomes more appropriate than Method 1.

Aside from the methodology which is in itself an area to be contended with in word response studies, the ultimate payoff of the anal-

TABLE 5*

Rotated Four-Factor Solution of Original Data and Three-Factor Solution for Each of Three Methods

ORIGINAL DATA					
Variable	I'	II'	III'	IV'	h^2
1	87				88
2	42	58	57		84
3	71			41	79
4			87	32	92
5	33			85	93
6		91			88
7		63	41	37	74
METHOD 1					
Variable					
1		—53			29
2			42		19
3		—32			12
4				—59	38
5			—59		36
6		31		56	45
7		32			11
METHOD 2					
Variable					
1		—62		35	52
2			—83		73
3		—67			47
4				—87	78
5			79		67
6			—43	52	53
7		76		35	71
METHOD 3					
Variable					
1		65			44
2			80		65
3		77			67
4				80	72
5				58	40
6			58	—41	50
7		—44	33		30

*All decimals and loadings of .30 and below are omitted.

ysis rests in its utility in answering the question about homogeniety of response across input variations. Clearly the variables can be interpreted variously. However, employing the parsimony principle would lead to a two factor solution and subsequent acceptance of response variance as a function of input variance. The present analysis consistently located the oral and graphic (printed words) treatment together. These two variables seem to define a factor rather clearly under Method 1. All other treatments analyzed under this method are combination treatments and fall into a second factor. Methods 2 and 3 generally agree with Method 1. Unfortunately, because of some arbitrary limitations put on the study, these factors are not completely identified beyond lending evidence to the view that input does affect output. The quality of this effect remains a task presently under investigation.

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Factors Which Influence the Word Recognition Process of Skilled Readers

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One of the most fascinating and complex areas of scientific inquiry has been the study of how words are recognized. Huey (1908) wrote, "Problem enough, this, for a life's work, to learn how we read! . . . To the average reader the process by which he gets his pages read is not understood very much better than was the performance of Livingstone by the savage." Although the process by which we recognize words is understood better today than in Huey's, numerous subtle questions remain unanswered. Despite gaps in knowledge, a sufficient amount is known that an explanation can be presented of factors which influence the word recognition process of skilled readers.

EYE MOVEMENTS

Javal (1879) was the first to describe the movements of the eye while reading. He discovered that the eye did not move with an even sweep across a line of printed words. Instead it moved with saccades, or little jerks with intervening fixations.

Eye movements consist of fixations, interfixations, and regressions. During the interfixation, when the eye is moving rapidly across the line of print, the reader is not able to recognize words. Only during the fixations, when the eye is relatively still, is the reader able to recognize words. During regressions, the eye returns to a previous position on the line which had been fixated and read. Obviously, since the eye returns to material which had been previously fixated, regressions slow down reading speed. The importance of the fixation pause to the act of reading is attested by the fact that it consumes from 92-94% of reading time. The interfixations use only 6-8% of reading time (Tinker, 1958).

The fixation pause is not a unitary act. It may itself be separated into three components: (a) the time it takes to stabilize or hold the eye still following the interfixation sweep across the page, (b) the time it takes to see the printed stimulus, and (c) the time it takes to centrally process (i.e., recognize and comprehend) what the eye sees. In tachistoscopic studies it has been found that if a second stimulus is flashed immediately following the flashed presentation of a first stimulus, the recognition process for the first stimulus can be disrupted (Gilbert, 1959). The amount of time required free from interfering second image stimulation varies from person to person (and may be related to intelligence). Thus, part of the function of the fixation pause is to prevent new stimuli from interfering with the recognition of the first image.

VISUAL ACUITY AND EYE-PHYSIOLOGY

Once the eye fixates on the line of print, the area which is in sharp focus is limited. As one extends outward from the area of sharp focus, the ability to discriminate letter shape decreases rather sharply. Most people are unaware of the rapid loss of visual acuity. The reasons for the lack of awareness are that the page appears equally bright from left to right, and we can see any part of the page clearly, simply by changing the point of focus. Since we usually are not aware of eye-movements, we often mistake the words recognized during several fixations for that which can be seen with a single fixation. At ordinary reading distance, only two inches of printed material may be recognized, but only three letter spaces are in sharp focus.

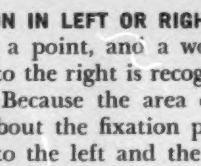
The reason for the sharp loss of acuity is that unlike a photographic film, in which the light sensitive photographic material is evenly distributed throughout, the light sensitive cones in the retina are concentrated in a small area called the fovea centralis. Thus, although the image from the page falls on the retina, only that part of the image which falls on the light sensitive cones of the fovea is seen with sharp detail.

WORD RECOGNITION IN LEFT OR RIGHT VISUAL FIELDS

If a person fixates on a point, and a word is flashed to the left or to the right, the word to the right is recognized more easily (Mishkin and Forgays, 1952). Because the area of sharp visual acuity is limited to a small area about the fixation point, the viewer sees the final letters of the word to the left and the beginning letters of the word to the right. Since the amount of information which each letter contributes to the identification of a word is greater for the beginning than for the final letters, the viewer is better able to guess the word which is flashed to the right (Broerse and Zwaan, 1966). The fact that beginning letters contribute the most information and that the reader is able to recognize a word when he perceives only a few letters is important in word recognition.

READING IS AN ACTIVE PROCESS

Many so-called errors in reading, such as inserting words which are not in the text, or failing to see words which are in the text, indicate that reading is an active process. By this I mean that while reading meaningful material, the skilled reader anticipates what words should come next rather than passively processing each word separately as though it were isolated from the others. By using the information contained in the words previously read as well as knowledge of grammatical structure, the reader anticipates what words should follow the



part already read. To illustrate the importance of structure, ask a friend to read aloud the sentence in the triangle. It is probably that because he reads what he expects to find, he will fail to recognize the error contained in the sentence. If the reader is given the following phrase, "red, white and ________", and is asked to insert the missing mord, he will probably say "blue". Both the failure to identify an error in the text and the ability to insert an appropriate word exemplify reading as an active process. The ability to utilize contextual cues and associative connections between words distinguishes readers who differ in reading speed. Faster readers use context cues more effectively.

CONTEXT

Since reading is an active process, we find that words which are represented in context can be recognized more rapidly than words presented in isolation. For example, in the context, "red, white and blue", the word "blue" is recognized more rapidly than when it is presented alone. In fact, for the speaker of English, the contextual constraints are so powerful that the word "blue" hardly needs to be shown to be recognized (Samuels, 1969; Staats, 1968, p. 499).

Although contextual constraints and associative connections between words usually facilitate word recognition, they can also promote faulty recognition. If the sentence: "The flag is red, white and black", was presented, many readers would incorrectly read the last word as "blue" rather than "black".

A THREE-STAGE MODEL FOR RECOGNITION OF FLASHED WORDS

Why is the word "blue" recognized significantly faster in the phrase "red, white and blue" than when it is presented alone? Three processes explain these findings. First, information contained in the part of the phrase already read is utilized. Second, this information is used to form multiple hypotheses of what words should follow. Suppose we read "the green ________". We form multiple hypotheses such that the next word might be money, lawn, paint, color, etc. Third, we test our hypotheses through partial perceptions provided by the letters in the next word on the page. If we see the letter "M" we recognize the word as money, if we see the letter "L" we read it as lawn. If the letter (s) perceived in the partial perception do not match any of the letters in the hypothesized words, then a more careful and time-consuming analysis of the word is required. Thus, this three-stage process may be conceptualized as an (1) information use, (2) hypothesis, (3) test procedure.

One of the ways skilled and unskilled readers differ is at stage two. Samuels (in press) found the skilled readers formed multiple hypotheses and could test them simultaneously, while beginning readers seemed to form single hypotheses and had to test them one at a time.

A word in isolation takes longer to recognize because the reader is unable to utilize prior information as a basis for forming hypotheses about what words should follow. Consequently, partial perceptions can not be efficiently utilized, and detailed time-consuming analysis of the word is required.

The word "black" in the phrase "red, white and black" is recognized significantly slower than the word "black" when presented alone (Samuels, 1969). The same three processes described earlier explain this effect. Prior information contained in the part of the phrase already read is used to form multiple hypotheses of what words might follow. The reader who gets a partial percept of the word to be recognized may see the letters "BL". Since the initial letters match one of the words hypothesized, he incorrectly assumes the word to be "BLUE". In tachistoscopic studies, the subject, once having mis-identified a word because of a prior set, tends to repeat the error persistently, and thus takes longer to identify the word correctly than when a word is flashed and the subject has no prior incorrect set.

READING MEANINGFUL MATERIAL

The factors which have been used to explain word recognition have usually been discovered in laboratory settings under artificial conditions. These findings will be used to explain how words are recognized when reading meaningful material under real-life situations.

1. On the assumption that a line of print is several inches or more in width, it is unlikely that the reader will be able to recognize all the words with a single fixation, and several fixations will probably be required.

2. At the point of focus, there is a narrow band (of about three letter spaces) in which letters are in sharp focus. A few additional letters are also seen, less distinctly, through peripheral vision. When words are recognized which extend beyond the narrow band of sharp vision, other cues and strategies are used to aid recognition (ex., word shape, context, guessing, etc.)

3. During a fixation, if only a few letters of a word are identified, those at the beginning provide the most information.

4. Because the skilled reader does not discriminate all letters in words he recognizes when reading meaningful material in context, we say that reading is an active process; that is, the reader anticipates and fills in that which he does not actually see.

5. In reading meaningful material, the reader uses information from the words previously read to anticipate which word (or words) should follow.

6. The anticipation may be in the form of multiple hypotheses. The reader may hypothesize that any one of the several words follow.

7. The hypotheses are tested by information provided through partial perceptions. If the letters perceived in the partial perceptions match the letters in one of the hypothesized words, that word is accepted. When there is a match between a hypothesized word and a partial perception, recognition is rapid. Morton (1964) found that there is a tendency for reading speed to increase towards the end of a line or sentence. The increase in speed would come about because a greater amount of information is available to aid in accurately anticipating the words which should follow.

8. If the letters recognized in the partial perception do not match the letters in the hypothesized words, speed of recognition is slowed down because a more time-consuming visual analysis of the word is required.

9. Reading speed is seriously curtailed when the reader falsely recognizes a word and continues to read until he becomes aware that what he is reading does not make sense. He must then regress to an earlier point to locate the source of the error. A false recognition may occur when the letters in a partial perception match some of the letters in a hypothesized word, although, in fact, the printed word is not the same as the hypothesized word.

10. Speed of word recognition will be facilitated to the extent that the printed material matches the cognitive structure and language habits of the reader.

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Two Gifted Rapid Readers—Preliminary Study

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THE PROBLEM

In an age when reading efficiency is of paramount importance because of the increasing proliferation of new knowledge, rapid reading programs, professional and commercial, abound. In the writer's rapid reading classes in the Evening Divisions of Northwestern University, there are enrolled high school, college, and post graduate students who initially read most written materials at the rate at which they speak—250 words per minute. After twenty hours of instruction, the average student will finish the course reading and skimming a college level essay from Brown's *Efficient Reading* about 2,000 words per minute with 70 per cent comprehension. But during the past four years, the reading behavior of a few students has been so extraordinary that they have been called "gifted rapid readers."

PURPOSE OF THE STUDY

The purpose of this preliminary study, therefore, was to investigate the "page-at-a-glance" reading phenomenon in two gifted readers using only monocular vision and to explore some of their limitations. To be meaningful, it had two objectives: It (1) identified two gifted rapid readers (defined as those who can critically comprehend somewhat familiar college level essays in Brown's *Efficient Reading* with at least 70 per cent comprehension at rates exceeding 20,000 words per minute) by means of a photo-electric mystagmographic (PENG) instrument; and (2) analyzed preliminary findings pertaining to the components of giftedness in rapid reading.

BACKGROUND OF THE STUDY

One century ago, in 1869, Galton published his monumental work, *Hereditary Genius,* in England.[1] In it, he ponders the development of eidetic imagery, or images that can be recalled at will. Certainly there have been well known studies since then probing whether heredity or environment accounted for genius or giftedness in those who possessed one or more extraordinary talents. But little more is known today about "photographic memory" or eidetic imagery.

Some reading specialists speculate that "page-at-a-glance" readers must possess highly developed visual imagery. Because of controversy stimulated by commercial speed reading courses, where the comprehension of many enrollees may be questionable at high rates, this explanation seems plausible when accounting for some of the reading behavior of some gifted rapid readers. But at present scientific studies of such gifted rapid readers are not to be found in the educational literature.

Yet, "page-at-a-glance" reading is not contemporary. Oscar Wilde and Chief Justice Hughes of World War I purportedly were observed reading at phenomenal rates on materials of interest to them. Moreover, President Theodore Roosevelt is said to have deliberately astonished his constituents by glancing at a page and then having them ask him questions about its content.

In 1957, with the aid of an ophthalmograph, Walton photographed the eye movements of average college students who read materials in the traditional manner.[2] Most could hear inner speech as they read almost word for word horizontally line by line. Nevertheless, Walton's and later S. E. Taylor's studies of eye movements of average readers revealed that the average person can accommodate clearly only a total span of 1.25 inches in one fixation (glance). In 1963, Taylor speculated that superior readers might read horizontally at maximum rates of merely 900 w.p.m. and actually be seeing all the words.[3]

This means physiologically, they are limited to grasping 2.7 words in their span of recognition at the average speed of 1/5 second. But many fail to realize these limitations are based on data which came from average readers reading the traditional way. The 1/5 second speed is the habitual rate of speaking used during oral reading. It is probably the result of training; not a physiological limitation.

The writer, therefore, observed that the pupil of the eye is round. Consequently, an acute visual span would encompass the size of a half dollar. In reading narrow newspaper columns, the eye could grasp 14 words (above and below the line in vertical "straight down the center of the column" reading) at once rather than 2.7 words. However, principles of gestalt psychology inform us that on connected meaningful patterns, it is not necessary to see everything acutely in order to gain complete recognition.

PROCEDURE USED IN THE STUDY

A. Selection of the Subjects:

During the seventeen years of teaching developmental reading at all levels beyond grade four, the writer has given individualized instruction to over 4,000 students. While teaching at Northwestern University in 1963, she developed an eclectic approach for teaching accelerated reading with comprehension. The Reinforced Reading System was founded on relevant aspects of psychological principles including operant conditioning procedures, reinforcement, closure, and transfer. Using this system, she has observed that gifted readers (who can maintain 70 per cent or above comprehension at rates above 20,000 w.p.m.) appear in her classes at a rate of 1 out of 100 or 1 per cent of the trained population.[4]

During the past four years, 15 subjects were identified as gifted according to the above criterion. Two of them, subject M.T.C., a 15 year old girl from the Philippine Islands, and subject R.D.B., a 12 year old American girl, volunteered for this preliminary study.[5] Both successful and unsuccessful reading behavior of each was observed by impartial reading experts from two other universities.[6] This will be discussed later. According to academic records, subject M.T.C. had an I.Q. of 100, but the test culturally was biased in favor of American citizens. M.T.C. was in this country only a few months before the testing. Although she spoke English, Tagalog was her native tongue. She had finished her sophomore year in an American parochial boarding school, and was here in the United States nine months before taking the rapid reading course. On the WAIS given by Dr. Bernard Harris of the University of Platteville in Wisconsin, she was in the bright normal range. But she had the highest possible score on the picture aptitude subtest. Harris concluded that she must have "photographic memory."

Immediately after the course in 1968, the *Nelson-Denny Reading Test*, Form A, was administered. She read at a rate of (4.5 seconds) 8,520 w.p.m. (99+ percentile rank) with a comprehension percentile rank of 81 for her norms. Her vocabulary rank was at the 80 percentile. One year later, in a follow-up study, she was administered the *Diagnostic Reading Test*, Form A for grades 7-13, another standardized test. She absorbed the pages at a rate exceeding (2.5 seconds) 41,000 w.p.m. with 85 per cent comprehension. Subject R.D.B., the seventh grade pupil, had an I.Q. of 125 on the P.M.A. test before instruction in rapid reading in the autumn of 1968. At that time her reading scores on the S.R.A. *Reading Achievement Test* were vocabulary 9.3 (48th percentile), comprehension 7.4 (73rd percentile), and a composite grade equivalent of 10.2.

Both youthful subjects were able to read and skim the textbook of the rapid reading course, *Efficient Reading*, by J. I. Brown, at rates consistently above 20,000 w.p.m. with at least 70 per cent comprehension.

b. The Measuring Instruments:

1) The Tests: Since the subjects practiced on Brown's *Efficient Reading*, essays from his Alternate Edition and from an out-of-print older edition were selected at random for this preliminary study. Brown determined the difficulty level of each article by applying the Flesch Readability Scale. The article, "The Devil and Daniel Webster," was estimated to be at the eighth-grade equivalent, or Fairly Easy. The other article, "It's Not Too Late to Learn to Read," was judged to be Fairly Difficult or at the 14th grade equivalent.

2) The Physical Instrument: The equipment of Dr. Nicholas Torek, of the Department of Otolaryngology at the Illinois Eye and Ear Infirmary, was used to measure speed and record the subject's eye movements during reading.[7]

While reading, the eye movements of only the subject's right eye were recorded with the photo-electric mystagmographic instrument (PENG). The instrument uses the principle of photo-electricity and differences in optical properties between the iris and sclera. While seated, each subject wore specially adapted industrial goggles. The left goggle masked the vision of the left eye. The goggle of the right eye was adjusted to trace eye movements.

Within the right goggle, two red lights illuminated the eye while four photo cells caught the light reflected from the subject's eye movements. These movements were amplified by the output of the energy from the photo cells. The output was transmitted into a machine with a sensitive electronic pen. It recorded the eye movement patterns onto moving graph paper and calibrated the rate of movement. Moreover, the photocell assembly was capable of picking up vertical eye movements.

3) *Questions to be Answered:* Specifically, the questions to be answered in the preliminary study were these:

a) What is the average duration of fixations made by gifted readers while reading a somewhat familiar article?

b) What degree of comprehension on materials of general interest can be obtained by gifted rapid readers during phenomenal rates of reading?

THE FINDINGS

1) *Subject M.T.C.: M.T.C.,* a 15-year-old Filipina girl, scanned "The Devil and Daniel Webster," a 6,000 word eighth-grade article, in 4.45 seconds, a rate of 80,000 w.p.m. She not only could perceive all the words on the 7 by 9 inches of print on each page, but absorbed both of the double columns per page simultaneously, averaging one fixation per page (since she could recall most of the page, two columns were not a problem.) The PENG recorded the duration and direction of the fixations made during reading. Figure 1 represents the graphic record of each fixation made on four full pages and two partial pages of the article. Incidentally, each full page has approximately 1200 words upon it in pica type.

The average duration of each fixation was also 1 or .80 second, and the average duration of inter-fixations or time it takes to turn the page or move from one column to another was .10 second. Because of possible head movements, the direction of the eye movements is estimated. An introspective interview with M.T.C. reinforced these interpretations from the graph. But the accuracy of the duration of the fixations is unquestionable.

The comprehension questions, prepared by Brown, consist of ten questions. Five are on the factual or literal level, and five are on the critical level of comprehension. These questions probed the purpose of the article and its implications. M.T.C. achieved 100 per cent comprehension. On guessing tests to judge if she was "testwise," M.T.C. scored negatively.

When interviewed later, M.T.C. said she did not believe she was photographing a "page-at-a-glance" totally. Certain words appeared in relief above others when she recalled specific passages. Moreover, when answering questions about a page she read, she could recall enough key words in order to "gestalt" or complete the thoughts of the passage meaningfully. She was aided by her past knowledge and experience pertaining to the topic of the reading material. (On extremely familiar topics, she thought she had total recall of what she read. In this situation, reading for her is a spontaneous memory process.)

2) *Subject R.D.B.:* The twelve-year-old American subject, R.D.B., scanned, "It's Not Too Late to Learn to Read," a 4,204 word 14th-grade equivalent article in 4.6 seconds. She therefore attained a rate of 54,825 w.p.m. with 90 per cent comprehension on the ten questions. This is consistent with her past achievement. She, too, grasped both columns of a page in one vertical fixation, apparently focusing her right eye near the center of the page. Figure 2 indicates she averaged one fixation per page at a rate of .75 second. Her average interfixation rate was slightly under .20 second.

When interviewed afterward, R.D.B. said she could instantly recall most of the words in the paragraphs which contained answers to the questions. During reading, there was interchangeable blurring and clarity of the pages. She could not control the situation and, when generally reading at phenomenal rates, she cannot predict when or where blurring will occur. Nevertheless, she sees enough passages so clearly that she can determine almost all of what is written on a page.

DISCUSSION

After the testing, preliminary interviews were conducted with each subject and her parents. In the case of the Filipina subject, M.T.C., it was revealed that her mother was a former college history professor and had an extraordinary memory. At the dinner table, the mother designed a game to determine who could remember names, persons, treaties, dates, and so forth better, M.T.C. or her brother. Apparently, M.T.C.'s unusual retentive ability was developed earlier and more intently than that of most pupils. Both heredity and environment tend to be involved in M.T.C.'c phenomenal development.

Moreover, in the case of 12-year-old American subject R.D.B., she also had an unusual relative. Her maternal grandmother, who was tested at the University of Michigan, demonstrated giftedness in non-verbal abilities. Since she migrated to the U.S.A. unable to read, no verbal scores could be obtained. Partly because of this, R.D.B.'s mother worked intently with R.D.B. and her brother in regard to their schoolwork. Again, heredity and an encouraging environment seem important factors in the reading success of this particular subject.

Besides evidence of superior ability to recall most of what was read, both subjects demonstrated strong dominance traits according to Butt's Factoral Facet Scale test.[8] Incidentally, visual examinations by local refractionists found both subjects had excellent eyesight. Undoubtedly, there are other factors present to explain the phenomenal ability of "page-at-a-glance" reading, and they will be explored with further testing in the coming year.

Limitations of the Subjects:

Again only preliminary analyses have been made of the reading abilities of M.T.C. and R.D.B. A larger study will control more rigidly studies with the potential and limitations of 15 rapid readers defined as gifted in this study. Thus far, only the success of each subject has been described, for they did indeed demonstrate the achievement questioned in this study. But it was reasoned from the beginning that it would be unrealistic to expect the subjects to read and skim *every* type of written material with excellent comprehension and retention.

Informally, M.T.C. was given a page from a directory of the American Psychological Association and was asked to find and recall details about a name on it. Dr. Alton Raygor, of the University of Minnesota, judged that she was unable to recall any more about the page than the average person, although she did find the name. She said the page was meaningless to her. On the other hand, when given 5 seconds to recall almost a complete page of 19 oddly designed faces, she gained almost total recall. Her comment was that it was easier to recall pictures. As she commented during the testing using only one eye, if the material being read is somewhat familiar, certain words stand out from a page and a meaningful pattern is grasped. Gestalt psychology suggests that the principle of closure operates this way in human perception.

However, while at the University of Minnesota, M.T.C. was given an article with three columns per page pertaining to the mechanical operations of an automobile. After successfully grasping two columns of an essay for Brown, who also was present, she tried and failed to read three at once.[9] Her comprehension appeared to be a guessing score of 30 per cent. Moreover, she expressed a strong dislike for mechanical knowledge, an attitude shared by many teenage girls. In this case, her ability to interpret meaningful responses obviously was limited. On another article being prepared for publication, she was told to read it word-for-word. But she did not resist the challenge for trying higher rates, and of course, found such speed inappropriate. Her rate was about 2,300 w.p.m. with 40 per cent comprehension. However, after having achieved her goal, that is, to obtain excellent comprehension with speed on Brown's article, she failed. This may be explained by the psychological concept of "homeostasis." After achieving goals requiring unusual pressure, the energy levels of a human lower and exhaustion often results.

Further investigations disclosed M.T.C. often could discuss intelligently what she read from her excellent recall and ability to "gestalt." Yet, she quite honestly would observe, "I often can recall confidently what an author *said,* but if I have no background on his topic, I can't tell you what he means. What is more, I must be in the mood to read at phenomenal rates; I do not enjoy it, for it takes enormous energy. But at lesser rates (1,000-5,000) I do enjoy reading some materials."

This commentary also applies to R.D.B. She passed all tests pertaining to general knowledge with excellent comprehension after reading at "page-at-a-glance" rates. Moreover, she frequently claims to have total recall of paragraphs the size of half the ordinary pocket novel page.

At Purdue University, on February 12, 1969, she was given a 2,000 word college level article to read with 28 assorted types of questions by Dr. George Schick and Dr. Merrill May. She scanned two adjoining pages at once at a rate over 60,000 w.p.m. and being unprepared for the types of questions asked, attained only 52 per cent comprehension. This was so inconsistent with her usual behavior, that she looked up her mistakes, reread the article and requested another challenge. Maintaining the same rate, she increased her comprehension to 72 percent on this article. She requested a third challenge, but it was thought unnecessary by Dr. Schick.

SUMMARY AND CONCLUSIONS

Using only the right eye, subjects M.T.C. and R.D.B. scanned non-fictional articles of general interest from Brown's workbook at "page-at-a-glance" rates of less than 1 second per page with excellent comprehension. They passed and failed some other materials under different circumstances. A combination of factors appears to have produced this qualified phenomenal ability. Besides the conditioning process and encouragement received in the Reinforced Reading Program, both subjects demonstrated above average reading abilities as well as indications of highly developed eidetic imagery and strong dominance personality traits. Certainly further tests must be administered to these and the other 13 students before definite conclusions may be drawn about factors common to gifted rapid readers. Further exploration of appropriate rates for different materials also must be studied.

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FIGURE 1*

Subject M.T.C. scanning, "The Devil and Daniel Webster." Total Rate = 4 9/20 seconds. Average Fixation Rate Per Page = .80. Av. No. Fixation Rate Per Page = 1. Inter-Fixation Rate = .10.

FIGURE 2*

Subject R.D.B. scanning "It's Not Too Late To Learn To Read." Total Rate = 4 6/20 seconds. Average Fixation Rate Per Page = .75. Av. No. Fix. Per Page = 1. Av. Inter-Fix. Rate = Almost .20 seconds.

* Each divisional line = 1/20 second. I.F. = Inter-Fixation Rate, indicating time taken to move from 1 column to another or turn the page. Ironically, rate in seconds per page or column is recorded *horizontally*. However, eye movements, which vary little left or right of the center of the page, indicates the subjects swept down the pages *vertically*, usually taking in both columns on the page in 1 fixation. (Horizontal line across graph indicates the center of page.)

FOOTNOTES

1. Sir Francis Galton, *Hereditary Genius*, Macmillan Company (London), 18[illegible].
2. Howard Walton, "Vision and Rapid Reading," *American Journal of Optometry and Archives of American Academy of Optometry*, 34, Feb., 1957. P. 79.
3. Sanford E. Taylor, *Eye Movements and Reading: Facts and Fallacies*, E.D.L. Reading Newsletter, No. 30. Huntington: Educational Developmental Laboratories, 1963. P. 13.
4. Florence Schale, "Using Special Modes of Learning, Grades IX through XIV," *Individual Differences in Reading* (H. Alan Robinson, ed.), Supplementary Educational Monographs, No. 91. Chicago: University of Chicago Press, 1964.
5. Mr. James Doran, of the McHenry, Illinos, Public School System, used the writer's 2R (Reinforced Reading) Method with his seventh-grade class and discovered gifted subject, R.D.B., who will be described later in the paper.
6. On Feb. 4, 1969, subject M.T.C. was tested at the University of Minnesota by Doctors J. I. Brown, A. Raygor, and W. Wark. On Feb. 12, 1969, subject R.D.B. was tested at Purdue University by Doctors M. May and G. Schick and their research assistants.
7. Dr. Torek's assistant, Miss Sharon Shively, tested each subject's reading while recording their eye movements on the PENG described above.
8. D. Susan Butt, "A Comparison of Measurement Strategies In Developing Scales for Dominance," Unpublished Doctoral Dissertation, University of Chicago, August, 1967. P. 171.
9. The essay that M.T.C. read successfully was from Brown's out of print edition of *Efficient Reading*. Taken from his records of over 600 former students, Brown averaged their scores which occurred near the beginning, middle, or end of a reading course. They averaged slightly over 400 words per minute with 68.5 per cent comprehension.

Psychological Principles in a Strategy for Teaching The Reading of a Standard Dialect

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This paper highlights one aspect of a multi-dimensional problem in reading: teaching the reading of English written in the standard or universal dialect to a segment of the population whose experience with that dialect has been limited. The target group is that one in which control over the dialect used by the general population is less well developed at the beginning of school that is that of its more privileged peers.

Most culturally disadvantaged pupils speak nonstandard varieties of English. The language handicap of culturally disadvantaged pupils is especially crucial because of the restrictions it imposes on academic achievement, particularly achievement in learning to read. It is a widely-held belief, and one shared by this writer, that failure to master the language patterns of standard English is directly related to the so-called "cumulative deficit" of this group as indicated by standard test scores in reading and other reading-related test scores in the content areas throughout elementary and secondary education.

The traditional and common point of view concerning the language usage of these pupils is reflected in the language instruction they are given. Its major characteristics is in the form of correcting pupils every time their English differs from standard English. For example, if a pupil says "them grapes" for "those grapes" or "dough" for "door" the teacher's usual procedure is to correct his usage or pronunciation by telling him how it should sound. This procedure probably does little good because in the pupil's language system "them" is a plural marker before nouns, and the sounds of "dough" and "door" are the same. The proof that the traditional teaching procedure is ineffective for most culturally disadvantaged pupils is that many of these pupils leave school after twelve years still speaking the nonstandard variety they spoke when they entered school. The nonstandard dialect pattern they have at the beginning of school is very resistant to extinction. This is true for several reasons. First, their dialect is the one they learned at home, in the neighborhood, in their church; in short, they hear it everywhere, including the school, because even in the school setting the only ones who use the standard dialect are the teachers. Another reason for the nonstandard dialect's being difficult to modify is peer pressure; for a pupil to adopt the teacher's language is often considered "phony" or worse, a step in the direction of forsaking one's birthright and cultural heritage. Another barrier to assimilation of the standard dialect is the attitude which some teachers project. Thus, the language of the nonstandard speaker is somehow inferior; nonstandard English dialects are sub-standard; and if one uses an inferior variety of English he himself may be inferior. Language is a very personal thing. Pupils whose language is always criticized soon come to feel that it is they themselves who are being criticized, and this reflects on their parents, their neighbors, and their whole world. Because teachers refuse to accept their words, pupils feel they are not accepted as persons. In turn pupils reject the teachers, and thereby in effect they reject school language, textbook language, and the language of the larger society.

All of this would be of little consequence were it not for the fact that pupils must learn to read the English language as it is written. The language is written in the standard or universal dialect. It is also well accepted that what a pupil gets from the printed page is directly related to what he brings to the printed page. When a pupil brings a nonstandard dialect to the reading of a page written in standard English, he will, more than likely, read his dialect into the print. This, then, serves only to reinforce his nonstandard dialect pattern.

Because linguists have studied the so-called Negro dialect in twenty-nine cities in the United States and have described its systematic deviations from the standard dialect, it is possible to indicate how the dialect pattern imposes itself upon certain aspects of reading performance. This problem has been labeled "interference" by linguists and is caused by the person who imposes the sound and grammatical system of his own language in the language to be learned.

INTERFERENCE

Interference in reading occurs between the vocabulary, sound and grammar of standard and nonstandard English. Several examples will serve to illustrate the principle. Pupils are often expected to read and pronounce words that are inaccurately represented by the English alphabet. Some pupils say "rat," the teacher says "rite" and the textbook represents the teacher's pronunciation with "right." Breakdowns in communication between teacher and pupil often occur because pupils omit or mispronounce the sounds represented by consonants at the ends of words, as when a pupil says, "a canal is a dish of water," and the teacher doesn't realize he means "ditch of water." Nonstandard speakers also impose the grammar of their language system on reading. Pupils may read the sentence, "We have taken a walk," as "We taken a walk." At first glance it seems as if only the word "have" is omitted—not too serious an error. However, if these pupils use the past participle form of take (which is taken) for the past tense form (took) then the sentence takes on an unintended tense.

Also, some pupils may not discriminate "taken" and "taking" which again shifts the tense and therefore the meaning.

STIMULUS DISCRIMINATION

Holland and Skinner (6) have described rather precisely the phenomenon of "interference" in their discussion of Stimulus Discrimination and Stimulus Generalization:

> When we read aloud our vocalizations are under the control of a series of visual stimuli on the page. The printed characters are discriminative stimuli, whereas the vocalizations are discriminative responses. A child learning to read is told he is "right" when the correct vocal pattern occurs in the presence of a certain visual pattern.

In the case of the pupil who uses a nonstandard dialect, his vocalizations represent an attempt to fit different sets of discriminative responses to very specific discriminative stimuli (printed characters). Holland and Skinner (6) further state,

> When faced with a new problem (reading) which has elements in common with an old one (his dialect pattern) we first try the old solution impotition of the dialect upon the printed characters). This process is generalization.

These authors note again that

> Nature seldom makes a single stimulus property the occasion for reinforcing a response; hence an abstraction is seldom developed unless a second organism arranges the appropriate contingencies for reinforcement. The verbal community determines which single stimulus property will be the occasion for reinforcing a child's abstract verbal response.

Herein lies the problem for the speaker of the nonstandard dialect in our society. The larger society has developed its discriminative stimuli (words on the printed page) so as to bring under the control of these stimuli the discriminative responses which already have been developed in the young by the members of the verbal community of the larger society. The verbal community in which the disadvantaged pupil has grown has reinforced different stimulus properties in language, and therefore the child develops abstract verbal responses which differ in minor but crucial ways from those of the larger society. The result is that when the child who speaks nonstandard English comes to school and attempts to learn to read a different (but similar) language, a phenomenon akin to retroactive inhibition occurs. What he knows keeps interfering with what he is trying to learn. The cumulative effect of this interference is manifested in lowered pupil achievement, high drop-out rates, and maladaptive behaviors which inhibit learning throughout the pupils' educational experience.

For whatever it is worth, there is in the Skinnerian system an explanation of what can be done to enhance the learning of discriminative responses in the standard dialect. It is to be borne in mind that the nonstandard speaker's major problem with the standard dialect is his tendency to generalize inappropriately the sounds of his dialect when he reads such words as "mens" for "men" and "feets" for "feet," and his inability to discriminate differences in sounds which are crucial to meaning in such words "flow" for "floor," "pas" for "past," and "hol" for "hold." Skinner (6, pp. 142-144) states that

> Discrimination is a special case of stimulus control. When a response has been extinguished in the presence of one stimulus and maintained in the presence of another, a discrimination has been developed. A discrimination procedure is essentially a multiple schedule in which one schedule is extinction.

Further, he states, "Bringing an operant (standard dialect) under stimulus control (printed characters) involves three events: (1) a stimulus, which is the occasion upon which a (2) response will be followed by (3) reinforcement."

It is clear from the foregoing that if the pupil is never able to emit the appropriate discriminative response in the presence of the stimulus because the appropriate responses are not in his response repertoire, little can be done until those discriminative responses are developed in his response repertoire. In simple terms this means that the pupil must be taught to speak the language well enough, before attempting to read it, so that he will be able to emit the discriminative responses and subsequently be properly reinforced in the presence of the discriminative stimuli.

One is tempted at this point to exclaim, "Well, why didn't you say so long ago?" It might be indicated that there is probably some value in placing the problem within the perspective of a fairly well-understood framework such as Skinner's. Assuming the foregoing references to Skinner's work are appropriate in this context, one must acknowledge that the arrangements for effecting the language training necessary imply considerable adjusting of the traditional public school program. It may take the first two or three years of school to teach pupils to speak the standard dialect. This circumstance would mean that formal reading instruction might need to be delayed until second or third grade for many of the pupils. It might mean that instead of reading instruction some of these pupils would be having "conversational English" in the first and second grade. This is probably what, in fact, should happen.

Aside from the predictable public reaction to such a suggestion, there are many professionals who advocate precisely the opposite course. Rather than delay, they want to start teaching reading earlier. Cracking the alphabet code in kindergarten has become a kind of status symbol. It is ironic that this type of simplistic code-cracking drill is one thing disadvantaged pupils can seem to learn. Indications are that they learn it about as well as any other group. This initial success has misled many professionals because it has given them the idea that initial code-cracking success will be followed by successful reading in the later grades. This has not happened.

The breakdown in reading comes later when pupils must reconstruct the meanings behind the alphabet symbols they decode. When the reading required goes beyond the simplest and most common words, where the meanings are shaded and the story content is removed from the pictures and hidden between the lines and beyond the print, it is then that the nonstandard speaker becomes an ineffective reader.

By delaying formal reading instruction for some disadvantaged pupils, time could be spent not only teaching the standard dialect but also teaching vocabulary. There is a qualitative difference between standard and nonstandard English which adds to the problem for the disadvantaged pupil. This qualitative difference lies in the area of vocabulary and is much more than a lack of words or fewer words within conceptual areas. The qualitative difference in vocabulary is a reflection of the qualitative difference in experience. Vocabulary is an outgrowth of experience. Stated another way, experiences are the symbols of concepts. If pupils lack experiences, their conceptual development and vocabulary will not be the same as others. In short, vocabulary reflects culture, and if the culture is disadvantaged then the vocabulary it generates will be disadvantaged also.

Work in the area of teaching reading to the disadvantaged has been characterized by random, trial-and-error, amateurish, and uncoordinated efforts. Many feel not much has been accomplished. The hope is that eventually our practices will reflect our faith in the basic principles of human growth and development, which we understand only imperfectly at best, but which are far better than the whims of dabblers and dilettantes or the pressures of public opinion.

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Factors Involved in General Reading Ability and Reading in the Content Areas

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This review of research on factors involved in general reading ability and reading in the content area is divided into two parts. The first organizes research on general reading ability into a developmental frame of reference. The second part reviews research on reading in the content areas.

In this review, we are trying to answer the following questions: (1) What factors are involved in general reading ability and reading in the content areas? (2) What developmental changes occur in these factors? (3) What is the relationship between comprehension of general reading ability and reading in the content areas? Comprehension of general reading ability may be defined by such tasks as reading for main idea, for sequence, to follow directions, and to draw conclusions (Russell and Fea, 1963). Reading in the content areas includes knowledge of technical vocabulary, interpretation of data, unique patterns of mental organization required to read the printed materials in each content field, devices, symbols, illustrations, and specialized purposes, motives and attitudes, which do not usually occur in tests of general reading ability (Russell and Fea, 1963; Smith, 1965; Moore, 1969).

DEVELOPMENTAL FACTORS IN GENERAL READING ABILITY

No factor analytic studies could be located at the primary grade level. However, data available from studies conducted in grades one and two can be used for inferring factor analytic results. At the first grade level, Gates, Bond and Russell (1939, p. 41) found that the best tests for predicting reading progress were word recognition, ability to complete a partially told story, giving words which end with the same sound as an example, blending word sounds, ability to read letters of the alphabet, and ability to listen, understand, and make use of the teacher's instructions in beginning reading. But, they emphasized:

> . . . to the extent that the teacher's methods influence pupils' techniques of learning, they also affect predictive value of tests. Thus, if the teacher effectively emphasizes early phonetic at-

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tack, tests of blending, rhyming, etc. are likely to give higher correlations with reading progress in her class than in the teacher's class where less emphasis is placed on a phonetic approach.

Reading comprehension also does not appear to be a general, unitary factor at the second grade level. McCullough (1957) reported that the intercorrelations of comprehension scores for tests of main ideas, details, sequence, and creative reading were low, ranging from .26 to .45. These correlations indicate that a second grader could perform well on one type of comprehension, but not as well on another. Consequently, instead of general reading ability, specific reading ability should be measured in the primary grades. But this specificity of reading comprehension tends to be overlooked in selecting standardized tests for the primary grades (Singer, 1970).

However, Buswell (1922, pp. 55-60), cognizant of the close relationship between reading instruction and reading achievement in the primary grades, attributed the form of the total growth curve in reading, as assessed by eye-movement studies, largely to the method of instruction. He found that (a) in average number of fixations and in average duration of fixation pauses, there is a rapid, but negative acceleration through the fourth grade, then a plateau, followed by a peak in the tenth grade, and then a leveling off; (b) in rhythmic movements (lack of regressions) growth continues all the way through to college. Buswell explained that

> The form of the total growth curve depends upon the order and rate of the various elements which enter into its composition. The theoretically most direct route toward maturity, which would produce the symmetrical development of all the elements involved, might be very different from the most economical and practical route.
>
> The direction of the route over which pupils travel depends largely upon the method of teaching. One school may begin its reading work by teaching children the alphabet, then simple words, and later sentences. . . . A still different curve of progress will be found when the initial emphasis is placed upon the sentence or some large thought unit.

The leveling off at the high school level, Buswell believed, represented either a state of "final maturation" or lack of continued training. Ballantine (1951) and Gilbert (1953) confirmed Buswell's findings on the shape of the growth curve. But instead of interpreting eye-movement behavior as solely a manifestation of central, not peripheral processes, Gilbert preferred an interactionist position.

Thus, in the primary grades, comprehension appears to be a function of a more specific factor, one which is dependent on instructional conditions. That is, an individual could perform well on one type of comprehension, but not on another because he had been taught or he learned one type of comprehension better than another.

In grades three through eight, comprehension tends to be related to a more general factor. A general factor is one that accounts for a wide variety of reading situations or tasks. In other words, an individual who performs well on one type of reading task will also tend to do well on another task. When Gates (1921, p. 310) administered a battery of tests which covered such a wide variety of reading situations, all the tests, except one, intercorrelated .70 or better. However, Gates concluded that the tests "do not justify the conclusion that we have in reading a group of functions bound by some general factor. . . . Reading is probably a 'broad function' . . . not a single capacity." Phelan (1940) arrived at a similar conclusion. After administering a battery of tests to 460 subjects, fourth and fifth graders, in six parochial schools in Chicago, and applying Spearman type factor analysis, she found that three factors accounted for 61 percent of the variance on the Durrell-Sullivan Reading Achievement Test: cognition contributed 52 percent; visual perception for words, eight percent; rote memory for words and letters, one percent; and other factors not accounted for, 38 percent to the variance in reading. Her interpretation of the results was that "no factor was universal to all the tests, common factors resulted from the influence of content, and, less prominently of process." Apparently the magnitude of the cognitive or verbal factor increases with further development of general reading ability. Using the Kuhlmann-Anderson Intelligence Test for defining cognition or the verbal factor, Holsopple (1948) found that the loading of the Stanford Paragraph Meaning Test on the verbal factor was higher at grade eight than at grade four.

Systematic changes in factors underlying general reading ability do occur during the reading developmental continuum. When test content was controlled by administering the same battery of tests in grades three through six, the factors identified at grades 3, 4, and 5 were found to merge at the sixth grade level. Visual Verbal Comprehension and Auding merged into Audio-Visual Verbal Comprehension; and Auding and Visual Relationship merged into Auditory Visual Relationships. The three resulting factors accounted for 76 percent of the variance on the Gates Survey of Reading subtest, "Level of Comprehension:" audio-visual verbal comprehension accounted for 56 percent; auditory visual relationships, eight percent; and speed of visual perception, two percent. The mergers were interpreted as an integration of auding and visual verbal comprehension at a more central level or organization (Singer, 1965; 1967). At the high school level, Holmes and Singer (1966) defined eight factors in a matrix of 56 variables, but power of reading, assessed by the Van Wagenen Diagnostic Examination of Silent Reading Abilities, correlated significantly on only three factors: 66 percent on audio-visual verbal symbolic reasoning, nine percent on auditory perceptual, and three percent on speed of visual perception.

Thus, it appears that from the sixth-grade level through high school, three factors account for some 75 to 80 percent of the variance in comprehension or power of reading.[1] The remaining 20 to 25 percent of the variance may lie in factors which were not tapped or did not emerge in these studies. Some factors reported in other investigations to enter into general reading comprehension at one grade level or another which may account for at least some of this remaining variance are the following: cognition (Conant, 1942), reasoning (Davis, 1942), auding (Caffrey, 1952), word meaning (Davis, 1942), verbal fluency (Langsam, 1941), number (Holsopple, 1948), values (Mandel, 1957), attention to accuracy (Kaiser, 1953), need to achieve (Bauer, 1946), personality characteristics (Athey and Holmes, 1969), and temperament (Richardson, 1949). Some of these factors appear to overlap with factors already cited. The additional factors tend to be drawn from the effective domain.

Thus, comprehension of general reading ability in the primary grades appears to be specific to instructional conditions. During the intermediate grades, comprehension draws upon a set of more general factors, and from the intermediate grades through the high school level approximately three-fourths of its variance is accounted for by cognitive, linguistic, and perceptual factors. Its remaining variance may be accounted for by factors in the affective domains and by factors that are more specifically related to the particular type of comprehension being assessed.[2]

READING IN THE CONTENT AREAS[3]

Although some factors become common to a wide variety of reading situations as individuals progress through the grades, reading comprehension is not a single complex of mental processes. From evidence based on eye-movement behavior in reading various types of material under several conditions, Judd and Buswell (1922) concluded that the processes involved in reading varied with the kind of material read, its difficulty, and the purposes of reading.

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[1] However, Davis (1968) reported that a multiple correlation and a "uniqueness analysis" yielded at the 12th grade level eight predictors of comprehension of literary type content and purposes. These predictors are similar to those factors identified earlier (Davis, 1942; 1944), which were questioned by Thurstone (1946).

In a private communication, Davis stated that a factor analysis of his 1968 matrix yielded two identifiable factors, reasoning and word meaning, the two factors identified in his 1942 study, which accounted for 89 percent of the variance. The discrepancy between Davis's two factors and his eight predictors may reside in differences in the basic assumptions of mental structure and organization underlying factor analytic and multiple correlation models (Holmes, 1965) and in the lack of the use of a test of statistical significance in extracting factors from a correlation matrix or in adding predictors to a multiple regression equation.

[2] Models have been constructed to represent these factors and their interrelationships (Singer and Ruddell, 1970).

[3] Appreciation is expressed to my research assistant, Sherrel Beasley, for her assistance on this project and to the ERIC/CRIER Center, Bloomington, Indiana, for summaries on research in the content areas, which were used as part of the sources for selection of research reviewed in this paper.

Similar conclusions have been reported in various studies conducted in content areas throughout the grades. Shores (1943) found that for ninth graders, science reading was related to power of reading, as assessed by the Gates Reading Survey subtest, "Level of Comprehension," but not to abilities in locating information or comprehending the general meaning of a paragraph. Shores and Saupe (1953) reported that in grades 4, 5, and 6 "Reading for Problem-Solving in Science," a test which contains content typical to that read in elementary school, correlated .63 with reading and .59 with arithmetic on the Progressive Achievement Tests, but had lower correlations than either of these variables with the California Tests of Mental Maturity. They concluded that "reading ability differentiates beyond the primary grades into somewhat specific abilities to read different kinds of materials for different purposes" (p. 157). Also, Kling (1965), in agreement with Holmes (1960) and Singer (1965) generalized that for comprehension in general reading ability or for reading in the content areas, individuals tend to mobilize, organize, and reorganize their capacities, subabilities, and processes according to momentary changes in their purposes and demands of the reading tasks.

Differentiating general reading comprehension, as assessed by the Gates "Level of Comprehension," from critical reading in social studies, as measured by an experimental edition of a social studies test, Sochor (1958) computed at the fifth grade a correlation of .64 between these two types of reading ability. With intelligence partialled out, the correlation dropped to .17. The lowness of the correlations led Sochor to suggest that separate measures should be used to assess general reading and critical reading in social studies. However, Fay (1950) found that reading skills (predicting outcomes, understanding precise directions, comprehension, reading maps, charts and tables, and using indexes, references and dictionaries), administered to sixth graders, were more closely related to achievement in social studies than to achievement in science or arithmetic when chronological and mental age were controlled. But he also concluded that reading achievement should be considered in specific areas, and that reading is a combination of many specific skills rather than a general ability.

Reading also has some factors in common with arithmetic problem solving. Balow (1964), controlling I.Q. in an analysis of covariance design at the sixth grade level, found that reading as assessed by the Stanford Reading Achievement Test had a statistically significant effect on the arithmetic problem solving subtest of the Stanford Achievement Battery. He noted that for a given level of computational ability, problem solving increased concomitantly with reading ability. But not all reading skills are equally involved in arithmetic problem solving. Treacy (1944), holding mental age constant, discovered that arithmetic problem solving was little related to such general reading abilities as predicting outcomes, getting the central thought, and interpreting the content, but was more related to mathematical vocabulary, ability to perceive relations, ability to note details, and ability to integrate dispersed ideas.

Another factor which enters into reading in the content areas was identified by Gans (1940). She determined that a factor of selection-rejection, defined by tests of reference reading, accounted for about 25 percent of the variance in a composite reading test (California Reading subtests, Thorndike-McCall, and Gates A, B, and D), administered in the intermediate grades. After giving the reference reading test at the college level she noted that both younger and older students manifested difficulty in maintaining the research questions within the bounds initially set, and in making judgments on relevancy. Since the reference reading test showed little improvement with years in school, she concluded that reference reading apparently was not systematically taught.

In one of the few factor analytic studies of the relationship between tests of general reading ability and reading in such content areas as geology, art, history, fiction, dictionary, tables, maps and graphs, Hall and Robinson (1945) identified at the college level the following factors for their types of reading situations: attitude of comprehension accuracy, rate of inductive reading, word meaning, rate for unrelated factors, and chart-reading skills. They concluded that reading skills for prose and non-prose materials are different, and that each of these skills is a composite of different subskills, abilities, and attitudes.

Why do reading abilities in specific subject areas differ from general reading comprehension? Russell and Fea (1963) summarized the differences succinctly as residing in (a) the technical vocabulary of each field, (b) patterns of mental organization required to read the printed materials of each field, and (c) devices, symbols, and illustrations characteristic of each field. Each of these factors, they point out, calls for specific teaching.

However, very few experimental studies on specific teaching of reading in the content areas have been conducted. From the sparse research available, the evidence is clear that reading in the content areas can be improved through direct instruction in one or more of its general or specific factors: Rudolf (1949) instructed eighth graders in interpretation of social studies materials, reference work, notetaking, outlining, and summarizing, over a five-month period, and found that her experimental group attained superior performance in social studies information, study skills, and comprehension. Johnson (1944) reported that a seventh-grade group not only improved in the mathematical vocabulary taught, but also in arithmetic problem solving ability which included this vocabulary. Barrelleaux (1967) concluded that use of library sources instead of a basic text in science resulted in superior growth in science achievement and attitudes for 42 eighth- and ninth-grade students, matched with a control group on ability and interest, perhaps because the library contained books to meet the wide variation in reading ability whereas the basic text was restricted in range.

But when there are not any common elements, there is likely to be little, if any, transfer from training in social science to another content area or to general reading ability. For example, Rushdoony (1963) found that map-reading skills, assessed by the Iowa Test of Basic Skills, which are normally taught to fourth- and fifth-graders, could be learned by a representative group of third-graders, but this attainment did not significantly improve their general reading ability as measured by the Stanford Achievement Test. Likewise, when fifth-graders were given direct instruction on arithmetic vocabulary, there was significant improvement, particularly among those in the average and superior intelligence groups, in arithmetic vocabulary and problem solving, but not on general vocabulary nor on reading comprehension as assessed by the Iowa Tests of Basic Skills (Vanderlinde, 1964).

Also, when specific vocabulary and purposes of reading in the content areas are emphasized, students tend to perform significantly better in comprehending the content. For example, in an experiment at the seventh-grade level on social studies content drawn from American history textbooks, Rehmann (1968) found increasing gains were realized in comprehension of vocabulary concepts under the following conditions: to the usual task or treatment of reading the selected passage and answering questions, he first added an expository advance organizer, then advance questions, and finally specific vocabulary instruction and marginal notes explaining vocabulary concepts. For all four comprehension skills (understanding explicitly stated content, recalling word meanings, making inferences about the content, and following sequence or structure of the content), the last two treatments, advance questions and specific vocabulary instruction, were superior to the use of expository advance organizers only, which did not differ significantly from the first treatment, reading the passage and answering questions which was used as a control type of treatment.

The relation between general reading ability and reading in the content areas depends to some extent upon purpose in reading. When two groups of eighth-grade students, matched on intelligence and general reading ability, were directed to read expository mathematical materials for different purposes, the group which read for main ideas had higher correlations with their general reading ability than the group which read for finding answers to a specific questions (Troxel, 1962). Similar results were attained by Shores (1960). Using a combination of California Achievement Tests and Iowa Silent Reading Tests plus the science achievement section of Sequential Tests of Educational Progress to equate two groups, he had one group read a science passage for the main idea and the other for recalling sequence of ideas. The results indicated that reading for the main idea correlated .65 with general reading ability while reading for sequence correlated only .51. Shores concluded that tests of general reading ability are not necessarily good predictors of reading science materials for purposes different from those demanded on tests of general reading ability.

SUMMARY AND CONCLUSION

In the primary grades, reading comprehension appears to be a specific factor, dependent on the conditions of instruction. During the intermediate grades, common factors emerge and these factors tend to integrate at a more central or mediational response level and become common to a variety of reading situations. Factors identified as underlying general reading comprehension in the sixth grade appear to be the same as those which emerge at the high school level. Some additional factors, primarily from the affective domain, have also been defined and found to correlate with general reading comprehension. Including all of these factors, we can state that general reading ability draws upon factors in the cognitive, linguistic, perceptual, and affective domains. However, reading in the content areas draws to some degree upon common factors and to some degree upon more specific factors, particularly when the comprehension tasks involve interpretation of data, knowledge of technical vocabulary, various patterns of mental organization in printed materials, use of devices and symbols, and specialized information, purposes, motives, and attitudes.

Although research on reading in the content areas is sparse, some specific factors have been identified, such as selection-rejection or judging relevancy in reference reading, and chart-reading skills. Also, some specific factors in reading science, social studies, and mathematical materials have been implied by research results. But the degree to which reading in the content areas correlated with common or specific factors depends upon the content of the tasks and purposes in reading them. Some experimental studies have demonstrated that when purposes in reading in content areas are shifted towards general reading abilities, such as reading for the main idea, there is a greater degree of relationship between the two types of reading.

Reading in the content areas can also be improved. For example, when specific vocabulary and purposes of content reading were stressed, readers gained in comprehension. Also, when individuals could select their own materials for reading science at the junior high school level their achievement was higher than that of students restricted to the basic text.

In general, investigators tend to agree that after the primary grades, "reading ability differentiates into somewhat specific abilities to read different kinds of materials for different purposes" (Shores and Saupe, 1953, p. 157). Hence, they recommend that reading ability should be assessed separately in each specific content area.

However, changes are occurring in developmental reading programs which are likely to have some consequences for the definition of general reading ability and for tests to assess it. For example, at least one elementary basal reader program has expanded to incorporate reading in the content areas: the Harper-Row series (O'Donnell, *et al.*, 1966), recently adopted by the State of California for use in all its elementary schools, contains two developmental sets of readers, one for development of skills in general reading ability and the other for instruction in reading in the various content areas of the curriculum. Consequently, we anticipate that tests to assess development of reading ability will also be expanded to include both types of reading. Then the distinction between general reading ability and reading in the content fields will tend to be diminished. How these changes will affect the developmental pattern of factors involved in general reading and reading in the content areas, of course, must await further research.

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A Reading Model of the Decoding Processes in Silent Reading

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The purpose of this paper grew out of the need to assist college students in the college reading center to better understand the decoding processes involved in silent reading comprehension.

BACKGROUND

Mann, Huey, Dearborn, Schmidt, Judd, Buswell, and others contend that silent reading is superior to oral reading for thought-getting. Literature also shows agreement that about 90% of all studies in college involves silent reading. Consequently, the art of silent reading ought to be mastered by all college students in the reading-learning process.

Yet observations voiced by college instructors, reports by individual students, results of directed reading activities and of standardized silent reading tests seem to overshadow assumed student efficiency in silent reading comprehension. To decode what has been read silently and then to comprehend is apparently one of the greater obstacles, if not the greatest, in the students' academic career. Curiosity led to additional evidence. During the past four years the writer has observed 2037 college students read silently. According to the results, 1886 students were inefficient, and of those 1573 could not recall that they had been taught to read silently during earlier schooling.

It is for this reason that the Reading Model of the Decoding Processes in silent reading comprehension on college level emerged, took shape, and has been tried over four years by college students. According to their reports the multi-media of the reading model worked for them not only during their time in the college reading center but also in their daily academic assaignments. Improved grade-point averages at the end of a term and results from standardized silent reading tests seem to support their claims. Mean differences in silent reading comprehension have been found statistically significant at the .001 and .01 level of confidence (7).

DEFINITION OF DECODING

In assisting college students to read more effectively, the following working definition of decoding in silent reading has been developed: Decoding in the complex act of silent reading involves the entire individual who through his total sensory apparatus receives signals or stimuli. These are transformed into messages by selecting meaning from background experiences which further require the individual to think, to evaluate, to interpret, to integrate, to appreciate, and, possibly, to communicate.

Decoding then in silent reading is not an end in itself but a means toward comprehending what has been read silently.

THE MODEL OF DECODING

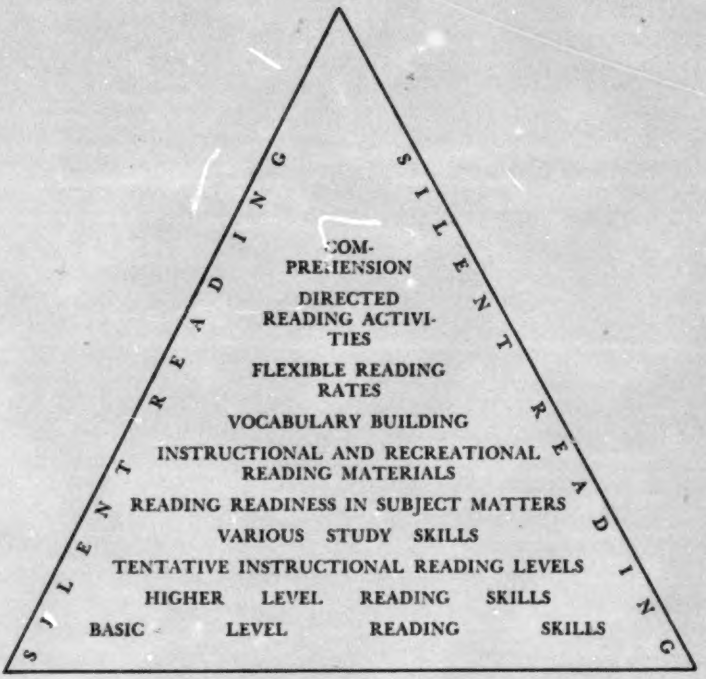
The model of decoding concerns itself with reading skills and techniques, with materials and media. The content of this model is for the developing college reader who requires further refinement in his silent reading skills. It is the content of this reading model that attempts to clarify and explicate relationship and interrelationship between reading skills, techniques, materials, and media needed to be acquired in the 'reading to learn' process. It is the content within and its application of the components of this model that make it different from those reported in the literature by Gray (1960), Kingston (1961), Smith (1963), Holmes (1965), Cleland (1965), Robinson (1966), and McCullough (1968) (1).

Skills, techniques, materials, and media substantiate the skeleton of the model. Relevant theories and practices embody the skeleton. Cognitive interactions and affective considerations infinitely intertwine the internal structure which unfolds the sequential development of the multi-media of the decoding processes. For the purpose of our discussions only, the components are treated in isolation which in actual silent reading performances cannot be separated. In the complex act of silent reading, theoretical lines disappear and each skill, technique, material, and medium is embedded in and grows out of the preceding one. To accommodate the integral parts of the reading model, the form of a pyramid has been chosen whose apex is silent reading comprehension (Figure 1).

The edifice of the total reading model rests on the foundations of basic reading skills and higher level reading skills which are followed by tentative instructional reading levels and various study skills. These are succeeded by reading readinesses in subject matters and instructional reading materials that affect vocabularies as well as flexible reading rates. Ascending to the apex of the pyramid, the integral parts of the decoding processes converge in the directed reading activities whose terminal output is silent reading comprehension. Thus, each component of the reading model is kept in its respective place through its own intrinsic properties that relate to the preceding as well as to the succeeding one, and together they radiate pertinent and relevant interrelationships within the complex act of decoding in silent reading comprehension.

Figure 1: The Model of the Decoding Processes in Silent Reading in the Form of a Pyramid.

It should be noted that 1) there are no horizontal or oblique lines separating one integral part from the other, 2) each integral part can freely intercommunicate with any of the other components, and 3) all integral parts together contribute to greatest possible silent reading comprehension.


SILENT READING
SILENT READING
SILENT READING
COMPREHENSION
DIRECTED READING ACTIVITIES
FLEXIBLE READING RATES
VOCABULARY BUILDING
INSTRUCTIONAL AND RECREATIONAL READING MATERIALS
READING READINESS IN SUBJECT MATTERS
VARIOUS STUDY SKILLS
TENTATIVE INSTRUCTIONAL READING LEVELS
HIGHER LEVEL READING SKILLS
BASIC LEVEL READING SKILLS

DESCRIPTION OF THE READING MODEL'S COMPONENTS

In the following synthesis each integral part of the reading model is analyzed and described so that silent reading abilities already mastered can be recognized in favor of those to be mastered.

1. Basic Reading Skills:

A. Students demonstrate own abilities in basic word recognition skills by reading silently. Refinement in structural and contextual skills is of particular concern for both assist in more effective textbook reading. When need arises, students apply pertinent syllabication or configuration or phonics skills toward goal of independent decoding in silent reading.

B. Sight words derived from the context or general and specific subject matter are collected systematically and practiced regularly where applicable. When being unable to decode difficult or unknown words independently by using basic word recognition skills, these words students are presented to be learned as sight words.

C. Students show perfected skills in handling independently dictionary, encyclopedia, glossary, and other source books in which they use the various book entries and their definitions. While the former necessitates diversified reference skills, the latter requires giving, selecting, and evaluating meaning according to context.

D. Students recognize, locate, remember, and communicate simple facts, objects, events, and statements read silently.

2. Higher Level Reading Skills:

A. From multiple meanings of single words or groups of words, students select and critically evaluate the literal or metaphorical meaning that harmonizes with the given context. This abstract and generic activity or conceptualization requires students to categorize, generalize, analyze, and synthesize.

B. Students examine and question relationships and interrelationships and their possible causes of and effects upon complex facts, objects, events, statements and inferences as they affect their reading-learning experiences in subject matters. The findings are critically interpreted, evaluated, and, when accepted, integrated within previous knowledge.

C. Students handle, read, interpret, and use charts, graphs, maps, diagrams, and tables as they appear in college textbooks and the various reference materials. This requires ability to understand special vocabulary terms, symbolization, special concept developments, and inductive and deductive methods.

3. Tentative Instructional Reading Levels:

A. Effective instruction in all subject matter begins with student's tentative instructional reading levels determined by using mutiple structured group informal reading inventories (6).

B. Results of these inventories indicate that a single student may have different tentative instructional reading levels in the areas under study.

C. Consequently, within a group of college students there are various reading levels which differ with each subject matter. During following and after effective instructions, individual reading levels will change.

D. Commensurating with students' tentative reading levels, multilevel instructional materials are used to avoid having students work on frustration levels.

E. Using results of standardized group reading tests, survey or diagnostic may actually compel students to begin work on frustration levels rather than on instructional levels.

4. Study Skills:

A. While studying in subject matter involves organizing a given body of knowledge, students need to acquire efficiency in applying consistently a chosen study method in that area.

B. Using college textbooks, skills in observation and question, memorization and concentration, selectivity and accuracy, and in originality and the will to work are acquired (2).

C. When the questioning attitude of the student's mind is aroused, subject-matter materials on instructional levels must be provided in order to sustain and to rekindle this attitude.

5. Reading Readinesses in Subject Matters:

A. Students have workable knowledge of 'being ready' to read silently. They use the teleological principle (5, 28) of setting purposes in accordance with course requirements, instructor's suggestions, and their individual insight into the reading.

B. Students' background experiences must be conducive to new and specific reading-learning tasks. Any background gaps need to be bridged by acquiring essential direct and/or vicarious experiences.

C. Since reading readiness changes with and in each college subject, students must be competent to handle a variety of reading readinesses. They are also aware that each accomplished stage of readiness is a step forward toward readiness for further successful subject matter reading.

6. Instructional and Recreational Reading Materials:

A. Greatest learning occurs when reading materials are within students' mental reach; i.e., challenging on instructional reading levels. If reading materials are above those levels, frustration ensues; if below, boredom and possible discipline difficulties may be invited.

B. To read materials for individual enjoyment, selections on students' independent reading levels should be recommended.

C. For gaining informations on approximate readability levels of textbooks and other reading materials, readability formulas may be applied. It will assist students in making individual adjustments in their academic efforts.

7. Vocabulary Building:

A. Insufficient word competency in fluent textbook reading arouses students' awareness that general and specific vocabulary building is an integral part of the reading-learning process rather than isolated word memorization.

B. Contextual and structural clues aid in acquiring general and specific meaning vocabularies. Emphasis is placed on a workable 'know-how' of building new words with prefixes, suffixes, and root words.

C. Through the dialectic method in developing vocabularies, students experience that specific literal work meanings may be surpassed by metaphorical meanings (4).

8. Flexible Reading Rates:

A. In becoming flexible readers, college students do not read all materials at a fixed rate, instead comprehend at a satisfactory rate which differs individually.

B. Reading multiple materials students detect that reading rate is dependent upon purpose, background, intelligence, proficiency in the basic reading skills, and the varying difficulties encountered in the reading materials.

C. Consequently, college students learn to understand that rate of reading is not just a number of words read per minute, but represents the speed with which thoughts are associated with printed words.

D. Since there are no uniform reading rates governing the silent reading act, skimming, scanning, associative and study-type reading are applied selectively in accord with the content.

E. In efficient silent reading, reading speed is usually improved over oral reading rate. If college students read silently with observable oral reading symptoms, they impede not only silent reading rates but also efficient reading comprehension.

F. Reading pacers and controllers, which are at best secondary motivators, may be used only to increase reading rates when the reader's meaning vocabulary and his reading comprehension are at par with his instructional reading level and when he reads habitually slowly.

9. Directed Reading Activities (5):

A. Through its sequence, structure, and intrinsic psychological endowment the Directed Reading Activity makes effective and successful silent reading comprehension possible for almost every college student.

B. Because of the varied reading-learning activities within the Directed Reading Activity, college students become active and constructive members of a working group in spite of different instructional reading levels and different individual capabilities.

C. The Directed Reading Activity's structural question technique after guided silent reading enables students to read for differing degrees of silent reading comprehension. Gaining skills in perception, apprehension, and comprehension is aided by fact-, vocabulary-, and inference questions.

D. The Directed Reading Activity's structural technique in oral re-reading and oral discussion assists college students to get clearer and deeper meanings from the author's words (3).

SUMMARY

It may be suggested that continuous application and systematic practice of the multi-media of this reading model can assist more effectively 1) those college students who through various deficiencies in the decoding processes are barred or delayed from attaining fullest silent reading comprehension, 2) those who while progressing in accordance with their own ability desire further proficiency in the art of silent reading, and 3) can ultimately aid in preventing college students to fall prey to obstacles in any integral part of the decoding process in silent reading.

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The Effect of Prior Letter Knowledge on the Learning of Sightwords

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The fact that there is a rather strong relationship between the knowledge of letters and reading performance in the first grade has long since been recognized. In the analysis of the nature of this relationship two stages may be distinguished. First, one can attempt to answer the global question whether the relationship between the two variables is functional or causal in character. The answer to this question requires experimentation in which the effect of knowledge of letters is as an isolated antecedent condition on reading performance is assessed. Subsequent attempts to answer this question are the research efforts directed to identification of the nature of the causality involved. Therefore, a second question to be asked is "If knowledge of letters is causally related to reading performance, why is this so?"

The literature related to letter knowledge and reading has been mainly directed to answering the second question. The work of Gibson and her colleagues at Cornell University and of Muehl may serve as an example. (Gibson, 1962a, 1962b, 1963, Muehl, 1960) Somewhat more directly related to the topic of this study is the research of Brown (1966), Bishop (1964), Jeffrey and Samuels (1967), Galocy (1969) and Kasow (1969). For the moment it is sufficient to summarize the findings of these researchers by stating that most of them found some kind of facilitating effect of prior letter knowledge on subsequent tasks. The study of Kasow is a notable exception in this respect. A more detailed statement of the findings of this body of research relevant to the interest of this study is cumbersome to synthesize. The results of these various studies are difficult to compare for a number of reasons, all of which basically have to do with a lack of agreement on definitions of both independent and dependent variables.

Some of the studies use regular English letters (Brown, 1966), others, Arabic letters (Bishop, 1962), or artificial graphemes (Jeffrey and Samuels, 1967). The stress placed on training for transfer shows a similar variety. Galocy (1969) devoted 2 out of 8 instructional days to training for transfer, both visually and orally; Jeffrey and Samuels have their students do only some blending of letters into words at the oral level.

"Knowledge of letters," which is in one form or another independent variable in the studies quoted here may, among others, mean:

being able to name the letters when shown (Galocy, 1969), to name the sound of the letters (Bishop, 1962) or both (Brown, Kasow).

The dependent variable, representing some aspect of reading performance, may be immediate or delayed recall of words beginning or not beginning with consonants taught during the time alloted to letter instruction (Brown, 1966). Other researchers, however, use the average number of trials needed to reach perfection on a word learning task, (Galocy, Kasow). Jeffrey and Samuels and Bishop in addition measure the number of correct responses on the first trial after instruction in the sounds of letters. It may be noted that even within the use of one type of dependent variable there are differences. The trials-to-criterion measure as used by Galocy differs distinctly with Kasow's interpretation of this measure.

The study reported here was undertaken mainly for two reasons. First of all it was felt that confounding of knowledge of letters with such factors as training for transfer prominent in all previous research has led to the failure to answer the question whether knowledge of letters as such is causally related to reading performance and to a failure to assess the strength of such a causal relationship if existent. Secondly, the researchers were curious as to whether the results of Kasow's study, which were somewhat deviant from the overall pattern, would hold him up in a study which was in part a replication of his research.

Subjects. The subjects for this study were 102 kindergarten students from a private school in a city in Northwest Georgia. Their ages ranged from 4.10 to 5.10 with a median age of 5 years and 3 months.

At registration these Ss were randomly assigned to one of 6 classrooms according to a list of random numbers, drawn from a random number table. Classrooms were assigned to teachers in the same manner.

Treatments. There were 2 treatment conditions with one control condition. An extended Solomon four design was employed with each treatment appearing with a pretested and non-pretested group. In all, 6 groups were formed. The six groups did not coincide with the six classrooms, since for each treatment and control condition half of the students of 2 classrooms (randomly selected within classrooms) was pre-tested and half was not. The two treatments were knowledge of letternames as they appear in the alphabet (treatment N), knowledge of letter sounds (an approximation of the sound of the selected letters as they appear in the CVC words used by us) (Treatment S). The control group did not learn letter-names or letter sounds. The design then is represented by the following paradigm, where O= test

R	O	N	O
R	O	S	O
R	O		O
R		N	O
R		S	O
R			O

Materials. Two sets of words were constructed. The pretest words were sip, rap, fin, can. The posttest words: hug, gum, leg, wet. Both sets of words were made up of 8 different letters, with no letter of the pretest words appearing in the posttest words. In addition to the pre and posttest, a letter test was employed which was made up of the 8 posttest letters: b, u, g, m, l, e, w, t. Both the words and the letters were stenciled on 3 x 5 index cards.

Procedure. Stage 1: From each classroom half the students were selected randomly for pretesting which was done by 5 examiners (one of the authors and four trained aides). Ss were randomly assigned to testers. The testing took place in an isolated room with 1 tester and one child per room. During two practice trials the child was familiarized with the 4 words he was going to be tested on. The examiner showed a word card, pronounced the word, gave a standard illustration of the meaning of the word (e.g. "You know what a sip is. When you get a coke you take a sip") and then asked the S to repeat the word. After the two practice trials 12 testing trials followed. The tester showed the S a card and asked him to say the word. If, after 5 seconds, no correct response was given E repeated the word and moved on to the next word. A trial consisted of a 4-word sequence. The order of the words was the same for all Ss. It was decided upon by randomly assigning the 4 words to a position within each trial.

Stage 2. After the pretesting, approximately 15 days of group letter instruction followed. The number of days a Ss was exposed to this instruction varied since each Ss was posttested as soon as it was determined that he knew the 8 letters. This decision was made on the basis of a simple letter recognition test. The rationale for this procedure is basic to the experiment. Since knowing or not knowing the letters (either by sound or by name, depending on the treatment) constituted the relevant variable, it was decided that both the time spent to acquire this knowledge and the method by which it was obtained was irrelevant to the purpose of the study. For this reason teachers were given general guidelines for the teaching procedures but they were not restricted to a prescribed set of teaching behaviors. They were asked, however, to confine their letter teaching to 2 10-15 minute periods per day. This was done in order to avoid too large a time gap between classes. The posttesting was done by two of the five pretesters. Since the letter teaching took place in a regular classroom atmosphere and the groups were relatively isolated from each other, no special placebo treatment for the no-letter training group was implemented. It may be necessary to emphasize that in none of the classrooms had prior letter teaching or word teaching taken place. Kasow (1969), using the subjects in the same school, one year earlier (but 4 months into the school year) found his subjects almost completely letter-naive. Checks during the pretesting reassured the examiners that only very few of the Ss knew any letters at all. On basis of the rigorous randomization procedures used, it was assumed that these Ss were randomly distributed over the treatment groups. The results of three students who could read were discarded.

Stage 3. During the letter instruction stage the two posttesters daily administered both letter tests and posttests. The procedure for the posttest was identical with that used for the pretests. Children who failed the letter' test were sent back to the classroom. They were posttested at a later date. The testing of the control group Ss was interspersed with that of the treatment groups.

Data analysis. The studies of Kasow (1969) and Galocy (1969) were quite alike in set-up and methodology. Where Kasow did not detect any differences between treatment groups, however, Galocy did. It was argued that this result may have been the consequence of a difference in dependent variables employed. Kasow had his students learn the sight words until they had two complete blocks of four words correct. He then counted the number of correct responses to the cue cards adding to this number 4 times the number of "unused" trials (each trial block consisted of 4 words). Galocy scored his successes in a slightly different way. In his system a child could reach criterion for a particular word (2 successes on that word in a row) while still learning the other words. He simply added the total number of trials needed to learn all of his 5 words and took an average of it. An adjustment was made for Ss who did not learn all words to criterion by adding one point to the average of each word not learned in 20 trials.

In view of the above, it was therefore decided to score the pre- and posttest in both ways. A- scores refer to Kasow's system, B- scores to Galocy's scoring.

Originally a 2-stage analysis of the data was planned. First, a preliminary treatment by testing Anova was performed. In absence of main and interaction effects involving testing, the posttest data of the pretested group was used for the main analysis utilizing the pretest scores as a blocking variable. Inadequately met assumptions necessitated further treatment of the data. (See the next section.)

Results

Table I gives the means and variances for A and B data. It must be emphasized that the A-scores are number correct and the B-scores number of trials. One expects an inverse relation between those scores. Since the preliminary analysis did not result in significant F-values, the posttest data were subjected to an Anova with blocking on the pretest.

TABLE 1

Posttest means and variances (between parentheses) for A- and B-scores of the 3 treatment groups

	Name		Sounds		Control	
	A	B	A	B	A	B
Pretested	26.20 (166.89)	27.07 (255.20)	29.33 (132.67)	25.00 (165.71)	27.67 (111.24)	26.86 (149.27)
Not pretested	30.27 (22.57)	23.00 (98.57)	26.07 (69.07)	28.66 (113.95)	23.60 (87.40)	36.26 (164.49)

For the A-data the resulting F was .05, for the B data F=.01. (These values are F-values, not probabilities). Since in both cases F'=1/F with v_2 and 1_1 d.f. exceeded F.95 (4,2)=19.25, it was concluded that there might be something wrong with employing the statistical model underlying the Anova for the type of data collected in the study. The F max. value for A and B data were respectively 7.39 and 2.59. (F. max. .95, k=6, d.f.=14 approximately 4.68). Chi-square tests of goodness of fit further revealed that the data did not fit a normal curve. Both distributions were heavily skewed. In addition it seems reasonable to doubt whether either dependent variable met the assumption of interval measurement. In view of these violations of the assumptions of the Anova, it was decided to reanalyze the data with non-parametric techniques.

For this analysis Wilson's (1956) non-parametric analogue of the p x g Anova was considered. However, the use of this technique was rejected in light of McNemar's (1957) and Sheffield's (1957) criticisms. The main effect of testing and the presence of disordinal interaction of testing and treatment (Bracht and Glass, 1968) was tested by a Mann-Whitney's U-analysis. The only significant effect was the main effect of testing in case of the B data. (z=1.70 which in view of the fact that one expects a reduction of the number of trials due to pretesting, i.e., a one-sided effect, is significant at the 5% level of significance). The fact that no disordinal interaction was present does not exclude ordinal interaction. The authors could not think of a suitable test for it, however. The reader is advised to plot the means on basis of the data in Table I.

In view of the above, the posttest data for the pretested and the not-pretested group were analyzed separately. The effect of the treatments was assessed by Robert Steel's Multiple Comparison Rank Sum test for comparing treatments with a control. Winer (1962) describes this test and gives a computational example. For the tables with the distribution of the Min $(T_1\ T_{1'})$ statistic, however, one has to turn to Steel's (1959) original article. In a sense, this technique allows a further analysis of an overall treatment effect, as can be detected for instance, by the Krusskall-Wallis analysis. The results of this analysis are summarized in Table 2. In order to determine whether a particular treatment effect reached significance, table values for one-tailed test were used, since the logical hypothesis in the experiment was that treatment groups would perform better than control groups.

As shown in Table 2, this hypothesis is confirmed for the N-treatment in the case of the non-pretested Ss. It must be suggested that the non-pretested groups are of major interest due to difficulty in interpretation of testing effects as explained above.

TABLE 2

Comparisons of treatment with control. Entries are Steel's min $(T_1, T_{1'})$ values for A- and B-scores

	A-scores		B-scores	
	N vs. O	S vs. O	N vs. O	S vs. O
Pretested	266.0	224.0	231.0	218.0
Not pre-tested	176.5*	214.0	162.5*	196.0

* = sign. at 5% L. S.

DISCUSSION

This study was of particular interest because of the problems of analysis involved. Quite often, it is the case that one forgets that the results of an experiment depend quite heavily on the type of measurement one employs. In the context of the experiment it seems very important indeed to ask: when does one say that a Ss has learned a word? Does one require that he produce all words involved in the task twice without error, that is: does one measure the Ss' performance per trial block? Or does one say that S has learned a word if he repeats it twice in a row, even if he misses other words in the block? This seems an equally well defensible position. One may even introduce other criteria of success on the reading task. Both Bishop and Jeffrey and Samuels, for example, use in addition to "first correct trial," the correct responses on the first trial as a measure of success.

In an attempt to find out why the data seemed to be so little fit for analysis of variance, a closer look was taken at the data of Jeffrey and Samuels (1967). Their Table 1 reveals that within the scores on one variable gross heterogeneity of variance exists, together with a rather prominent deviation of normality. (One of the score distributions for instance has a zero variance.) Apparently Samuels and Jeffrey too had trouble meeting the assumptions of analysis of variance. Maybe one of the most important things to do in this field is to establish measurements which lend themselves for analysis with powerful statistical techniques and which are open for a check on the reliability of the measurement of some sort. Data of the latter kind are most frequently absent: The reason is that at this time no technique is known, at least not to these authors, to satisfactorily estimate reliability in the kind of task used in these experiments. Maybe one needs to consider 'time to learning' more seriously as a discriminating index of performance. It is to be seen, however, where such a measure would stand as far as validity is concerned.

In this experiment knowledge of letter names seemed to have some facilitating influence of the learning of selected sight words. In view of the limitations of this study, though, the authors feel very reluctant to generalize beyond the letters selected, the words used as criterion and the condition of absence of pretesting.

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A Dynamic Theory of Reading?

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It is difficult to say when the word "model" first became an important part of the adult reading specialist's professional vocabulary. I am, of course, referring to a model which has the kind of curves a statistician draws. Primarily for my own interest I made a cursory search of our professional literature. I wanted to see if I could pinpoint the time when modeling became an appropriate professional activity.

Nila Banton Smith (1965) has the perspective to speak with some authority about the history of reading. In the International Reading Association's 10th Annual convention she talked about milestones in the development of the field. According to her reckoning, the sixth and latest milestone was erected about 1950. In describing the condition of the field prior to that time, she cites Scott's review of research between 1940 and 1950 (Scott 1954). Scott said that "The most tantalizing and stimulating characteristic of reading research findings is their inconclusiveness." He continued that "With proper tending, pruning, and thinning the contributions of research in reading can be greatly enhanced." It is Smith's contention that "since the time of Scott's criticism we have been 'tending, pruning and thinning' and currently laying another milestone." And what is that milestone which has been building since the early fifties? According to Smith, it is the use of theoretical models in reading research.

Another support for the notion that model building began in the fifth decade comes from our past president, Paul Berg (1969). Writing in the 18th Yearbook of the National Reading Conference he suggested a radical development in reading research that took place in the late fifties. He refers to studies which "develop a theoretical position offering an explanation as to why certain observed behavior took place." Specifically he is referring to *The Nature of Reading Disabiliy* by Smith and Carrigan (1959), *The Treatment and prevention of Reading Problems* by Delacato (1959) and the substrata factor model by Holmes (1954). These three efforts usually are considered the preeminent examples of model making in reading research.

It is, of course, quibbling but correct to point out that the research is always done prior to publication. In point of fact Holmes' original dissertation was defended in 1948. Thus the commitment to careful research and modeling in reading goes back somewhat before the mid fifties. In any case, it seems fair to state that for the field of reading our model is not much more than an adolescent, and clearly under the age of consent.

A MULTITUDE OF MODELS

If our model making does not have a long history it has certainly had a varied one. Clearly the work of Holmes, Delacato, and Smith and Carrigan is pre-eminent in this activity of model making. Their efforts are undergirded, as all models should be, with at least reasonably adequate empirical foundations. These authors have made some conscious attempts to provide rigorous connection between the observable world and the theoretical constructs.

But such has not been universally the case. There have been other so-called models of reading which I would call, at best, speculative. That is, in some cases theoretical superstructures have been erected on somewhat less than concrete foundations. These "models" are more properly metaphors, plausible, intuitive reconstructions. They serve to integrate and perhaps stimulate further investigations rather than summarize what has been done. Often they go far beyond what is known, into the area of raw speculation. Kingston has offered a correspondence model of comprehension. According to this model comprehension is said to exist if the ideas in the mind of the reader and writer correspond (1960). Simmelroth (1965) and Clark (1965) have offered information processing models to account for reading. Another plausible reconstruction of what might be the reading process is set forth by Goodman (1965). He suggests that reading involves a series of tentative decisions which the reader makes on the basis of partial clues available in the printed page. Other models, such as the template matching notion, seem to fit into this general category of speculative models in reading. Most currently we have the interesting static model presented by Manzo at this symposium (1969). He offers in one rather complex equation to handle most of the variables that he considers important in the reading process.

All of the above mentioned professional-intellectual activities have been called models. I shall not discuss whether the word "model" is appropriate in all cases. But I seriously doubt that any of them, even the highly sophisticated and statistically oriented work of Holmes and Singer, can truly be called dynamic.

DYNAMIC PROBLEMS

By "dynamic" model I wish to suggest the same intuitive difference as that between a snapshot and a motion picture. Models are time specific. They can describe the reading act at a particular time and with the reader in a presumed particular state. But I would submit that we have nothing today that comes even close to being analogous to a moving picture of the reading process. There are several reasons why I feel the dynamic model cannot exist at this time.

First of all, many of the proposed models can be rejected out of hand since they are almost totally lacking in adequate operational definitions. No matter how appealing they may be intuitively they are not useful for research. Manzo's model, which I use as an illustration primarily because it's handy, is a striking example. Of the 11 theoretical terms used in the model only one comes close to being operationally defined. And that one is T, which is defined as time. All the other concepts are metaphorical. They can perhaps be made behavioral and operational, but no evidence is offered, at least in the paper that we heard today. Thus I am afraid I would have to reject many of the proposed offerings as being interesting heuristically but in terms of research classified as non-models.

A second problem with dynamic modeling, assuming that the variables have been operationally defined, is to specify mathematically the relationship between them. Manzo is to be congratulated for attempting to make such an explicit specification. His models show that certain terms multiply each other and certain terms are exponential powers of others. Presumably the common laws of arithmetic apply. That is, knowing the value of a variable called Tc, we know that it must be multiplied by a measured value of variable Ms, and the product raised to the power fb. In such a case the model can be tested. But there are other interactions that are not quite so testable. We are told for example that one of the complex components is "dramatically affected by the decoding skill (Ds) of the reader." It is a little more difficult to specify the nature of this relationship between the variables.

A third and more damaging problem for dynamic modeling is that most reading variables cannot be measured rapidly enough to function dynamically. For example, it takes various time lengths to gather information about different variables. Reading rate is usually measured over a time span of from one to three minutes. In that interval there are tremendous fluctuations of behavior (Wark 1968a). Yet, we assume that one number adequately describes what is going on inside the reader. It may take anywhere from 10 to 30 minutes to administer a comprehension test. Yet we assume that "the comprehension score" is an adequate measure of behavior at some specific time. This measure is not treated probabilistically, rather as an absolute.

What happens in a "dynamic" model? We make statements about changing states in the reader, on the basis of thoroughly inadequate data. That is, we try to make statements about what's going on inside the reader from moment to moment. The endeavor is hopeless since it takes us several moments merely to gather information about the reader. In other words, since we lack instantaneous measures of reading behavior, we can't talk about instantaneous changes in the process, and therefore we cannot talk meaningfully about dynamic models or "moving pictures" of the reading process.

There is a fourth problem that prevents us from developing dynamic models of reading. This problem flows from the whole psychometric approach. The psychometric approach assumes that when we give a test we are measuring some underlying quality or process in the student. We assume that there is, for example, a thing called critical reading. Then we build a test to measure it. We assume that the scores on that test give us some indication of the underlying quality or mechanism within the student. Thus we start with an assumption and then infer from our data how much of the assumed quality does indeed exist. Using this approach we have developed many tests of the reading process. Yet when these tests are factor analyzed there are often fewer factors than there are tests. In other words, the psychometric proliferation of reading research tends to obscure the nature of whatever processes there may be. If my analysis is correct, we are better off talking about dynamic assumptions of the reading process, not dynamic models.

A DIFFERENT APPROACH

I would like to suggest that we need a radical new approach if we are to build a dynamic model of reading. I would like to propose the name Behaviormetric for this approach. Essentially the behaviormetric point of view assumes nothing whatsoever about the internal process of the reader. Internal states are posited only when they are demanded by the results of observation. We start out assuming as little as possible. We accept only what can be observed. We attempt to explain the process from the outside, peripherally, mechanistically, objectively. Then as our explanations at the surface level become less and less tenable we move further and further into the central core of the reader. Tentatively we propose and test more and more process variables. It seems to me that this approach, using behaviormetric data starting from the outside and working in, will lead us to develop dynamic models which would be impossible or at least unlikely starting from a furnished interior and moving out.

Let me give you an example of behaviormetric approach. The illustration was suggested to me by Mrs. Diane Hill, a colleague at Minnesota. We must go outside the field of reading and consider nocturnal enuresis; sleep walking or somnambulism; pavor nocturnist, or sleep terror of children; and nightmares of adults. These medical-psychological problems have been with us for generations. Writers from antiquity up to the time of Freud believed that they were all caused by night time demons pressing on the sleeper's chest. Freud of course dispensed with this demonic nonsense and taught that both nightmares and night terror of children were the results of repressed sexual impulses. The fact that most sufferers could report no nocturnal adventures in the morning was evidence of the mechanism of repression. Still in spite of lack of data the four types of disorders have been interpreted as being due to dream activity. Now what about the behaviormetric analysis?

One of the most interesting developments in recent human research is Dement and Kleitman's classification of sleep (1957). Using electroencephalographic techniques they are able to measure the depth of sleep. They are also able to indicate whether or not the sleeper is dreaming. Dreams are almost invariably correlated with rapid eye movements which show up on the electroencephalographic chart. When a sleeper shows rapid eye movements, or rem sleep, and is immediately awakened, he will almost invariably report dreaming. Sleepers awakened during non-rem sleep will make no such report. Thus we now have a way to test the hypothesis that the four disorders of sleep are associated with dreaming.

Broughton (1968) tested a series of sufferers from the various sleep disorders. He found that there were no demons pressing on his subject's chest; there may or may not have been repressed sexuality involved, but there was certainly no dreaming related to sleep walking, enuresis, or night terror. The most striking aspect of the study was that the sleep disorders were all associated with arousal from light sleep rather than from dreaming. The other interesting finding is that when people are awakened suddenly from light sleep they tend to be disoriented, forgetful, and badly confused. They tend to have trouble adjusting to the room or conditions into which they awake. Since they were not in fact dreaming, they reported no dreams. Yet to Freud, their essentially physiological confusion was a sign of repression. Thus the behaviormetric approach may not have solved the problem of the sleep disorders. The approach did not lead directly to any kind of treatment. But it did clear up a lot of nonsense about the process itself and suggest a whole new way of looking at four problems. Perhaps the approach can do the same sanitizing duties for the field of reading.

What sort of reading data do I mean by behaviormetric? Basically I refer to on-line moment-by-moment data about the behavior of the reader. The classic example of this kind of data of course is eye-movement photographs. However, the early pictures took a long time to develop. And there was no way to record other data simultaneously. Now the new electromyographic eye movement cameras make it possible to get on-line time specific eye movement data. Along with that data, other measures can be gathered. The work of Hardyck and Patrinovich (1969) and Edfeld (1960) on subvocalization is an example. Blood pressure, pulse, respiration recording can be made at the same time reading is taking place. With increased sophistication in electronics, it will be possible to monitor brain wave activity during reading. The work by Kahneman and Beatty on pupil diameter as related to intellectual activity seems to be relevant (1966).

Blink rate is another variable that could be investigated. Fred Davidson (1969) has shown that the color of the retina of the eye is related in some way to emotional activity. These variables can all be measured in real time. They can be intercorrelated to give a dynamic picture of the reading process. Admittedly they are both physiological and peripheral. What about more traditional language variables? Can they currently be measured in real time?

Cloze techniques, particularly with oral reading, would seem to be the first relevant type of reading behavior that could be investigated dynamically. It might also be possible to involve the student in this research in a rather novel way. We all know that students sometimes complain of not comprehending their reading material. At other times they seem to feel that they do indeed comprehend. I do not know of much systematic research to investigate the behavioral variables which taken together in interaction are associated with the students reports of "I comprehend" or "I do not comprehend." What I'm saying, in other words, is that we should perhaps measure peripherally what the student is doing and tentatively accept the student's report of his own internal state as a criterion measure. With that approach perhaps we could develop a dynamic model of reading.

THE CHARGE

In organizing this symposium, Frank Greene asked me to consider this charge: "If in two years NRC were to have another meeting on comprehension, what have we thought about today which could be followed up in such a manner that we would have information related to comprehension not presently available?" I have attempted to present my view of a basic need in reading research—the need for behaviormetric data. I have suggested we lack on-line, real time information about peripheral variables which, considered all together, may give us a picture of the reading process. But how can we gather such data, with only modest expense for equipment? What can be done with an .8 mm motion picture camera to gather data on total body movement during reading? Can more be done with adult readers' self reports, accepted as tentative hypotheses? What do the frequencey and fluency of verbal association to text projected on a screen tell us about comprehension? (Wark 1968b). I would hope that you will address yourselves to these questions. I am confident that there are several dozen good doctoral dissertations hiding here, ready to be presented at this conference in two years.

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A Hierarchy of Reading Behaviors

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A major problem in reading research remains the vagueness and ambiguity of the terms used in describing basic behaviors (7) (8). The lack of precise definition prevents effective communication among students in reading (9), and is a definite barrier to the development of more adequate theories about reading behavior (6). The inadequacies of the descriptive labels employed in describing reading are evident in even a casual examination of the tests employed to measure its components (1) (2) (5). The crux of the problem of course lies in the complexity of the reading process as well as the fact that certain of the more essential reading behaviors are of a covert nature and hence are not readily subject to objective observation and measurement (12).

One term which causes particular problems is comprehension (3) (4). It is not readily measured. It seems to have a wide range of meanings. It is the *sine qua non* of reading behavior. Different specialists provide lists of varying lengths and descriptions of the comprehension "skills." Much of the so-called debate over the preferred methods for teaching reading to beginners appears to center around the degree to which comprehension should be stressed in the daily or weekly lessons. Each side, by the way, seems to claim to be on the side of comprehension and the whole business illustrates the importance of defining terms prior to debate.

In a previous paper the writer suggested that it is important to separate reading behavior, i.e., how the organism reads, from reading pedagogy, i.e., how reading is or should be taught, if we are to make progress in explicating the reading process (8). The following discussion is limited to descriptions about the reading behavior of mature readers and is not concerned at present with how they were learned. First, it may be argued that if reading is a thought process, and it seems to be generally accepted that it is, we must recognize that many different types of thought may function while the individual reads. At times the individual merely recognizes stimuli; on other occasions he must engage in involved patterns of associative recall. At still other times he must focus his attention on a narrow field of symbols which represent something unknown, and the reader faces a learning task. In all probability these behaviors are present to varying degrees in all types of reading behavior.

It also should be stressed that in all types of reading behavior the reader is engaged in a symbolic process. He always is inputting graphic symbols and responding in a number of different ways. Hence it can be argued that there is some type of comprehension involved in even the most simple word recognition act. Actually, the reader attaches meaning or understanding to the symbols he responds to. Word recognition probably is not so simple as reading teachers might have us believe, and can be regarded as one type of comprehension rather than as a separate component of reading behavior.

In an effort to pursue this line of reasoning further the writer developed ten categories of reading behavior and/or reading comprehension manifested by able adult readers. These categories are shown in Table I and arranged in order from simple to complex.

TABLE I

A HIERARCHY OF READING BEHAVIOR AND COMPREHENSION

Reading$_1$ —Simple recognition of a signal, i.e., a true decoding act; e.g., sighting of a sign marked *EXIT* or *NO SMOKING*. Many types of reading of this sort in modern civilization. Recognizing one's name in print.

Reading$_2$ —Skimming to locate a specific fact or datum, i.e., a simple recognition act—sorting in "binary way" e.g., "yes-no." Looking for telephone number of specific concern or person.

Reading$_3$ —Reverie, purposeless reading. Use of reading as a time killer, e.g., reading any magazine or newspaper while in the doctor's office. Reading while going to bathroom. Results from a learned reading tendency or habit. Reading act more important than what is read. Aimless search for something of interest, no attempt to learn but attention is sporadic according to materials which attract or stimulate. Cathexis (energy value) of ideas precipitate more active reading response of reader from time to time.

Reading$_4$ —Attention focused on recognizing simple signals, e.g., who, what, when, where, why. Typical of newspaper reading habits for sophisticated reader. Attention stimulated or flagged by who, what, when, where, why associations as it involves the "life space" of the reader. Cathexis (energy value of idea, as in Reading$_3$) stimulates greater activity and attention.

Reading$_5$ —Writer's words serve to play on emotions, feelings, or affect of reader. Examples: poetry which serves to promote images, sensory impressions. Readers role usually fairly impassive. Examples of such materials include "The Eve of St. Agnes" by John Keats, "Kubla Khan" by S. T. Coleridge, and similar poems. Pornography and erotic writing designated to excite represents another class of materials of this type. Propaganda and similar subjective writings also tend to titillate the affective domain rather than stimulate purposeful thinking.

Reading$_6$ —Reading to follow directions as in putting together an object received unassembled, making a cake. Here reader decodes facts of message in orderly sequential fashion as ordered by writer. Role of reader here still secondary from reasoning viewpoint, but success depends on sequential comprehension of each succeeding phase of the communication. The direction of thinking is established by the writer's order of presentation.

Reading$_7$ —Reading that results in the acquisition of new concepts, facts, or ideas. Contents serve to help reader recall previously learned but partially forgotten details. Keynote here is that there is no retroactive inhibition due to negative motivation on reader's part or interference due to conflicting previous learning. Thought process rather is simple acquisition.

Table I (Cont.)

Reading$_8$—Reading contents serve to stimulate a reorganization and/or modification of previously learned facts, principles, beliefs, values. Reader's motivation is positive. New facts do not conflict noticeably with those previously held. Learning form is elaborate. Reorganization not so extensive as to cause, doubt, and trauma. Reading and reordering may occur simultaneously.

Reading$_9$—Critical reading. The contents read are deliberately tested against previously learned beliefs, facts, concepts, values. Reasoning process results in some acceptance, some rejection of principles dealt with. Hypotheses may be formulated and accepted or repeated.

Reading$_{10}$—Applied or Creative reading. Information read is organized and modified by reader so as to be applicable to the solution of an analogous problem, to extend and enrich the applicability of the author's discussion, to be a basis for the logical elaboration or for the formulation of new generalizations or principles.

In order to determine whether the hierarchy made sense to others, the identifying number subscripts were removed and the categories listed on 3x5 cards. The cards were sorted randomly in packs of ten and a group of twelve advanced doctoral students in reading was asked to sort them in such a manner that the most simple behavior was first, the second most simple behavior was second, and so forth. The cards thus would range from simple to complex.

The rankings of the twelve students, all of whom held master's degrees in reading, were analyzed by Kendall's Concordance Technique (w) (10). The Spearman RHO coefficient yielded by the concordance method was +.915 significant at the 1% level of confidence. These results indicated that knowledgeable students of reading tended to rank the categories in the hierarchy in a similar manner. The average rankings of each category were identical with the original hierarchy with but one exception. The group ranked Reading$_9$ (critical reading) higher than they ranked Reading$_{10}$ (applied or creative reading).

In order to test the possibility that the wording or the form of the statements provided unwarranted clues which aided students in ranking the categories, the task was administered separately to two additional groups. The first group consisted of advanced doctoral students enrolled in a first course in psycholinguistics. None of these students had studied reading. Using the concordance technique, a coefficient of +.12 was obtained. A second group of thirteen classroom teachers enrolled in an inservice course in research also ranked the behaviors. This group consisted mostly of secondary teachers and only three had had a course in reading. The rankings of this group yielded a nonsignificant coefficient of +.08. On the basis of these nonsignificant coefficients it would seem safe to conclude that the high relationship of ranks obtained by the reading scholars was not due to the wording or form of the statements.

There are a number of implications of this modest experiment. First, it seems feasible, using a scaling technique, to develop more precise terminology in reading. Speaking about Reading$_1$ as contrasted by Reading$_{10}$, may afford greater precision in communication between scholars. Secondly, this technique may hold promise for stimulating better theorizing and research. It seems feasible, for example, to develop tests which may measure different types of reading comprehension with greater reliability and validity if we employ models of this type. Thirdly, it also might be feasible to analyze the reading behavior of beginning readers, advanced readers, and mature readers to determine the type of reading which seems predominant. Off hand, for example, one might speculate that beginning readers function more often in the Reading$_1$ Category while college students and professionals function more in Reading$_7$, Reading$_8$, and Reading$_9$. It also may be that hierarchies of this type may furnish the means for testing Skinner's provocative statement that reading is a tendency rather than an ability (11). Finally, the device reported here provides an excellent vehicle for motivating advanced graduate students. The sorting task described is a challenging one. Students like to discuss it. They have opinions about their own rankings. The technique makes them aware of the many problems in classifying and describing the complex behavior of reading.

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